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SELECTED WATER RESOURCES ABSTRACTS

VOLUME 9, NUMBER 11
JUNE 1, 1976

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CODEN: SWRABW

U.S. DEPARTMENT OF THE INTERIOR OFFICE OF WATER RESEARCH AND TECHNOLOGY

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SELECTED WATER RESOURCES ABSTRACTS

A Semimonthly Publication of the Water Resources Scientific Information Center, Office of Water Research and Technology, U.S. Department of the Interior

VOLUME 9, NUMBER 11
JUNE 1, 1976

W76-05001 -- W76-05500

The Secretary of the U.S. Department of the Interior has determined that the publication of this periodical is necessary in the transaction of the public business required by law of this Department. Use of funds for printing this periodical has been approved by the Director of the Office of Management and Budget through August 31, 1978.

As the Nation's principal conservation agency, the Department of the Interior has responsibility for most of our nationally owned public lands and natural resources. This includes fostering the wisest use of our land and water resources, protecting our fish and wildlife, preserving the environmental and cultural values of our national parks and historical places, and providing for the enjoyment of life through outdoor recreation. The Department assesses our energy and mineral resources and works to assure that their development is in the best interests of all our people. The Department also has a major responsibility for American Indian reservation communities and for people who live in Island Territories under U.S. administration.

FOREWORD

Selected Water Resources Abstracts, a semimonthly journal, includes abstracts of current and earlier pertinent monographs, journal articles, reports, and other publication formats. The contents of these documents cover the water-related aspects of the life, physical, and social sciences as well as related engineering and legal aspects of the characteristics, conservation, control, use, or management of water. Each abstract includes a full bibliographical citation and a set of descriptors or identifiers which are listed in the **Water Resources Thesaurus.** Each abstract entry is classified into 10 fields and 60 groups similar to the water resources research categories established by the Committee on Water Resources Research of the Federal Council for Science and Technology.

WRSIC IS NOT PRESENTLY IN A POSITION TO PROVIDE COPIES OF DOCUMENTS ABSTRACTED IN THIS JOURNAL. Sufficient bibliographic information is given to enable readers to order the desired documents from local libraries or other sources.

Selected Water Resources Abstracts is designed to serve the scientific and technical information needs of scientists, engineers, and managers as one of several planned services of the Water Resources Scientific Information Center (WRSIC). The Center was established by the Secretary of the Interior and has been designated by the Federal Council for Science and Technology to serve the water resources community by improving the communication of water-related research results. The Center is pursuing this objective by coordinating and supplementing the existing scientific and technical information activities associated with active research and investigation program in water resources.

To provide WRSIC with input, selected organizations with active water resources research programs are supported as "centers of competence" responsible for selecting, abstracting, and indexing from the current and earlier pertinent literature in specified subject areas.

Additional "centers of competence" have been established in cooperation with the Environmental Protection Agency. A directory of the Centers appears on the inside back cover.

Supplementary documentation is being secured from established discipline-oriented abstracting and indexing services. Currently an arrangement is in effect whereby the Bio-Science Information Service of Biological Abstracts supplies WRSIC with relevant references from the several subject areas of interest to our users. In addition to Biological Abstracts, references are acquired from Bioresearch Index which are without abstracts and therefore also appear abstractless in SWRA. Similar arrangements with other producers of abstracts are contemplated as planned augmentation of the information base.

The input from these Centers, and from the 51 Water Resources Research Institutes administered under the Water Resources Research Act of 1964, as well as input from the grantees and contractors of the Office of Water Research and Technology and other Federal water resource agencies with which the Center has agreements becomes the information base from which this journal is, and other information services will be, derived; these services include bibliographies, specialized indexes, literature searches, and state-of-the-art reviews.

Comments and suggestions concerning the contents and arrangements of this bulletin are welcome.

Water Resources Scientific Information Center
Office of Water Research and Technology
U.S. Department of the Interior
Washington, DC 20240

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ABSTRACT SOURCES

SELECTED WATER RESOURCES ABSTRACTS

1. NATURE OF WATER

1B. Aqueous Solutions and Suspensions

SALT AND NONELECTROLYTE INTERACTIONS IN WATER,
Pittsburgh Univ., Pa. Dept. of Chemistry.
For primary bibliographic entry see Field 2K.
W76-05245

2. WATER CYCLE

2A. General

A PROPOSED INDEX FOR COMPARING HYDROGRAPHS,
Maryland Univ., College Park. Dept. of Civil Engineering.
R. H. McCuen, and W. M. Snyder.
Water Resources Research, Vol. 11, No. 6, p 1021-1024, December 1975. 6 fig, 8 ref.

Descriptors: *Hydrographs, *Hydrograph analysis, *Unit hydrograph, *Model studies, *Correlation analysis, Hydrology, Storm runoff, Time series analysis, Average.
Identifiers: *Pearson product-moment correlation coefficient, Standard deviations, Cross-product.

Existing goodness of fit indices are inadequate for comparing model-generated hydrographs with measured hydrographs. The Pearson product-moment correlation coefficient, which is the most frequently used index of regeneration, is inadequate because it is insensitive to differences in the size of the two hydrographs. A better coefficient of regeneration is obtained if Pearson's coefficient is adjusted by using a ratio of the standard deviations of the two hydrographs being compared. The resulting index is numerically the same as the regression of the hydrograph with the smaller variance on the hydrograph having the larger variance. Examples were used to illustrate the superiority of the modified correlation index. (Lardner-ISWS)
W76-05157

BAYESIAN GENERATION OF SYNTHETIC STREAMFLOWS.
Resource Analysis, Inc., Cambridge, Mass.
G. J. Vicens, I. Rodriguez-Iturbe, and J. C. Schaake, Jr.
Water Resources Research, Vol. 11, No. 6, p 827-838, December 1975. 10 fig, 6 tab, 13 ref, append. OWRT C-418(9021) (11). 14-310001-9021 NSF GK-41643X

Descriptors: *Statistical models, *Stochastic processes, *Synthetic hydrology, *Streamflow forecasting, *Time series analysis, Water resources development, Mathematical models, Model studies, Management, Projections, Decision making, New Hampshire.
Identifiers: *Bayesian analysis, *Blackwater River(NH), *Uncertainty, Synthetic streamflow generation.

Generation of synthetic streamflow traces has proven to be an extremely useful technique for the evaluation of water resources planning and management alternatives. But existing models do not account for the uncertainty in the streamflow parameters. Past research efforts have focused on obtaining 'best' estimates of these parameters which are then used as the 'true' values of the process. Bayesian methods were here used to overcome this shortcoming. By incorporating the parameter uncertainties into the generation scheme, alternatives may be evaluated under both the natural and the parameter uncertainties. This was accomplished by integrating over the probability distribution of the parameters to obtain the Bayesian, predictive, or unconditional probability distribution function (pdf) of the streamflows. Use of the Bayesian pdf for synthetic generation was shown to lead, on the average, to better designs under uncertainty conditions. (Morris-ISWS)
W76-05271

A BAYESIAN APPROACH TO ANALYZING UNCERTAINTY AMONG FLOOD FREQUENCY MODELS,
International Inst. for Applied Systems Analysis, Laxenburg (Austria).
For primary bibliographic entry see Field 2E.
W76-05272

HYDROLOGIC SEMANTICS,
Geological Survey, Reston, Va.
N. C. Matalas, and T. Maddock, III.
Water Resources Research, Vol 12, No 1, p 123, February 1976.

Descriptors: *Hydraulic models, *Mathematical models, *Technical writing, *Reviews, Evaluation, Technology, Translations, Calibrations, *Model studies.
Identifiers: *Semantics.

There is an aura of mystique that surrounds mathematical modeling of water resources systems. Perhaps some of the mystique is due to the semantics of modeling rather than to the accomplishments of modeling. The literature describes three basic steps in mathematical modeling: (1) identification, (2) calibration, and (3) verification. Identification implies that one has available a set of models that covers all aspects of the physical system of interest and has sufficient information to select the model that applies. Calibration implies that for the parameters of the identified model, one has control over the degree of accuracy in a particular estimation. Verification implies that the identified calibrated model, tested under controlled conditions, mimics the physical system of interest and therefore the identified calibrated verified model is to be accepted. The words identification, calibration, and verification are misleading because of their connotation of greater understanding of and control over the physical processes than actually exist. Perhaps the words selection, parameter estimation, and acceptance are more in line with the true capabilities of modeling. The modeler in fact selects from a finite set of available models, estimates the model's parameters under less than controlled conditions, and then on the basis of some criterion of 'goodness of fit' accepts or rejects the model. The words selection, parameter estimation, and acceptance remind us that a model is an abstraction of the physical process and not the physical process per se. (Woodard-USGS)
W76-05414

2B. Precipitation

FAR-INFRARED AND SUBMILLIMETER WAVE ATTENUATION BY CLOUDS AND RAIN,
RAND Corp., Santa Monica, Calif.
D. Deirmendjian.
Journal of Applied Meteorology Vol. 14, No. 8, p 1584-1593, December 1975. 3 fig, 4 tab, 37 ref.

Descriptors: *Attenuation, *Infrared radiation, *Microwaves, *Weather, Clouds, Rain, Fog, Water vapor, Water, Electromagnetic waves, Radio waves, Radio communication systems, Optical properties, Refractivity, Absorption, Raindrops, Drops(Fluids), Meteorology, Electrical engineering.
Identifiers: Extinction coefficient, Raindrop size distributions, Far-infrared radiation, Submillimeter waves.

Newly determined optical constants for water at far-infrared and submillimeter wavelengths, as revealed by a recent survey, were used to estimate water cloud and rain attenuation over the wavelength range between 12 micrometer and 2 cm. For this purpose new analytic drop-size distribution models simulating fog, nimbostratus cloud and rain, corresponding to rainfall rates of 10 and 50 mm/h, were set up. The corresponding volume extinction and absorption coefficients as computed according to polydisperse Mie scattering theory at specific wavelengths were listed in tables and presented graphically in plots for purposes of interpolation. It was found that cloud extinction may exceed 50 nepers per kilometer in the region of wavelengths less than about 100 micrometers, whereas for wavelengths longer than 200 micrometers, under near-saturated conditions, water vapor absorption should be the dominant attenuator. The greatest attenuation by heavy rain may be expected around a wavelength of 5 mm with a value of about 5 nepers per kilometer. The results also suggested that in the presence of nonprecipitating water clouds or fog there may be a relative transmission 'window' centered around a wavelength of 1.3 mm. (Sims -ISWS)
W76-05164

AN APPROXIMATION FOR THE SHAPES OF LARGE RAINDROPS,
Michigan Univ., Ann Arbor. Dept. of Atmospheric and Oceanic Science.
A. W. Green.
Journal of Applied Meteorology, Vol. 14, No. 8, p 1578-1583, December 1975. 2 fig, 1 tab, 19 ref, 2 append.

Descriptors: *Raindrops, *Drops(Fluids), *Model studies, Mathematical models, Cloud physics, Shape, Evaporation, Reynolds number, Pressure, Dynamics, Meteorology.
Identifiers: *Shapes of raindrops, Terminal velocities, Aerodynamic pressure.

A simple model was proposed for approximating the shapes of raindrops in terminal fall equilibrium. The equilibrium figures of raindrops are complex, but they can be represented approximately as oblate spheroids, which have axis ratios determined by the balance of surface and gravity forces at the equator. The axis ratios and drop diameters predicted by the model correlated well with experimental and other theoretical results. Using empirical formulas for evaporation from ellipsoids and the results of the model, estimates of ventilation coefficients were made. It was found that drop deformation may cause a small diminution of ventilation coefficient compared with evaporation from an equivalent sphere. (Sims - ISWS)
W76-05165

ANTARCTIC SEA-ICE VARIATIONS FROM SATELLITE SENSING IN RELATION TO CLIMATE,
Department of Science, Melbourne (Australia). Antarctic Div.
For primary bibliographic entry see Field 7B.
W76-05398

2C. Snow, Ice, and Frost

SYMPOSIUM ON REMOTE SENSING IN GLACIOLOGY.
International Glaciological Society, Cambridge (England).
Proceedings of the third symposium on glaciology, Cambridge (England), September 16-20, 1974. Journal of Glaciology, Vol. 15, No. 73, 1975. 482 p.

Descriptors: *Conferences, *Remote sensing, *Glaciology, *Ice, *Snow, *Antarctic, *Arctic, *Arctic Ocean, Snow cover, Glaciers, Cold regions, Analytical techniques, Satellites(Artificial),

Surveys, Radar, Measurement, Water temperature, Temperature, Physical properties, Optical properties, Electrical properties, Sonar, Lake ice, Sea ice.
Identifiers: ERTS, Satellite imagery, Radio-echo sounding.

Remote sensing is a new and important tool for glaciologists. The symposium objective was to provide a comprehensive guide to remote sensing for those using it to study ice. Subject areas included reviews of the present state of the art in various branches of remote sensing, and the reporting of recent and topical work of studies relating to snow and ice. (See W76-05373 thru W76-05400) (Humphreys - ISWS)
W76-05372

THE ELECTRICAL PROPERTIES OF SNOW AND ICE,
Birmingham Univ. (England). Dept. of Physics.
J. W. Glen, and J. G. Paren.
IN: Symposium on Remote Sensing in Glaciology; Proceedings of the third symposium on glaciology, Cambridge (England), September 16-20, 1974. Journal of Glaciology, Vol. 15, No. 73, p 15-38, 1975. 10 fig, 3 tab, 66 ref.

Descriptors: *Remote sensing, *Electrical properties, *Snow, *Ice, Glaciers, Conductivity, Electrochemistry, Laboratory tests, On-site investigations, Temperature, Cold regions, Glaciology, Radio waves.
Identifiers: Dielectric dispersion.

This paper reviewed the electrical properties of snow and ice that are of importance in remote sensing using electrical devices. After a review of the observed laboratory behavior of ice samples and the microscopic theory which has been advanced to explain this, data on temperate and polar glacier ice were compared with the laboratory data. Temperate glacier ice is generally rather similar to laboratory ice, but certain relaxation processes found in the laboratory are absent from the glacier ice. Polar ice, on the other hand, is considerably different in its dielectric behavior from 'pure' laboratory ice, or temperate glacier ice; in many ways it more resembles doped laboratory ice, despite its variable, sometimes low, impurity content. It also resembles in behavior ice produced by freezing supercooled water. The electrical behavior of snow, and the attempts to account for this in terms of the behavior of the ice and air components, and also of the water component in wet snow, were next discussed. Finally, the implications of this work for radio-echo sounding of ice, radar reflectivity from wet and dry hydrometeors, devices for determining the water content of snow, and resistivity surveys of glaciers were discussed. (See also W76-05372) (Sims - ISWS)
W76-05373

THE DIELECTRIC PROPERTIES OF ANTARCTIC ICE,
Birmingham Univ. (England). Dept. of Physics.
W. J. Fitzerald, and J. G. Paren.
In: Symposium on Remote Sensing in Glaciology; Proceedings of the third symposium on glaciology, Cambridge (England), September 16-20, 1974. Journal of Glaciology, Vol. 15, No. 73, p 39-48, 1975. 5 fig, 26 ref.

Descriptors: *Ice, *Antarctic, *Electrical properties, Glaciers, Laboratory tests, Conductivity, Temperature, Cold regions, Glaciology, Radio waves.
Identifiers: Dielectric dispersion, *Dielectric properties.

Two 0.5 m cores from 'Byrd' station, Antarctica, were studied in the laboratory, one from a shallow depth (155 m) and the other from the zone where recrystallization has given a vertical c-axis fabric and the air in situ is thought to be in clathrate form (1,424 m). The dielectric response was studied in the frequency range 60 Hz to 10 kHz, and in the temperature range -6 C to -60 C. The behavior observed was markedly different from that of 'pure' polycrystalline ice such as may be made by slowly freezing distilled de-ionized water. The Antarctic ice was shown to have properties similar to those of the ice from 'Camp Century' and 'Site 2' in Greenland. In an attempt to discover what factors determine the difference in electrical behavior between polar ice and pure ice, some samples were melted and subsequently refrozen slowly. Their dielectric response was similar to that of pure polycrystalline ice. These results were discussed in connection with the impurity content and growth conditions of the ices. (See also W76-05372) (Sims - ISWS)
W76-05374

RADIO-ECHO SOUNDING: GLACIOLOGICAL INTERPRETATIONS AND APPLICATIONS,
Scott Polar Research Inst., Cambridge (England).
G. de Q. Robin.
In: Symposium on Remote Sensing in Glaciology; Proceedings of the third symposium on glaciology, Cambridge (England), September 16-20, 1974. Journal of Glaciology, Vol. 15, No. 73, p 49-64, 1975. 2 fig, 49 ref.

Descriptors: *Ice, *Remote sensing, *Glaciers, Radar, Sounding, Ice cover, Bedrock, Aircraft, Navigation, Electrical properties, On-site data collections, Glaciology.
Identifiers: *Radio-echo soundings.

After a brief review of factors relevant to the propagation of radio waves in ice, problems of profiling the upper and bedrock surfaces of ice sheets were considered. These include deconvolution of echo traces and accurate navigation. Results already available not only provide knowledge of sub-ice geomorphology, but also confirm our general ideas on interaction of temperature and flow in large ice sheets. Difficulties encountered in the study of temperate glaciers appear to be due to irregular dielectric properties of the ice mass, which in turn suggest an irregular distribution of water. In the future, application of radio-echo methods should lead to more detailed knowledge of accumulation and ablation over ice masses, improve our understanding of temperatures at great depths in polar ice sheets, and give data on ice movement from central areas of ice sheets. (See also W76-05372) (Sims -ISWS)
W76-05375

THEORY OF RADIO FROM GLACIER BEDS,
Bristol Univ. (England). H. H. Wills Physics Lab.
M. V. Berry.
In: Symposium on Remote Sensing in Glaciology; Proceedings of the third symposium on glaciology, Cambridge (England), September 16-20, 1974. Journal of Glaciology, Vol. 15, No. 73, p 65-74, 1975. 4 fig, 11 ref.

Descriptors: *Glaciers, *Ice, *Remote sensing, Aircraft, Radar, Sounding, Data processing, Analytical techniques, Bedrock, Glaciology.
Identifiers: *Radio-echo soundings.

The theory of interpreting the echoes received back at the source from a glacier bed illuminated with a wide-angle beam of quasimonochromatic radio waves was reviewed. It is convenient wherever possible to separate bed relief into 'geography' and 'roughness'. 'Geography' is the surface that results from horizontally smoothing the bed over distances comparable with the mean height h of the source above the bed. The geography can be deduced from the time delays of specular reflections, provided these can be identified. 'Roughness' is the statistics of the departures of the actual bed from the geography on scales down to about one-tenth of the predominant wavelength in the travelling pulse. The average height S and horizontal dimension L (where these quantities can be defined) of the irregularities can be deduced from measurements of the average value of the echo envelope rho as a function of time delay. It is also possible to distinguish qualitatively different beds with the same S and L. If the source-receiver unit moves keeping h constant, then rho fluctuates about its mean value. This 'spatial fading' can be used to detect horizontal ice displacements of less than one hundredth of a wavelength. To detect vertical ice motion it is necessary to observe the phase of the echo. (See also W76-05372) (Sims-ISWS)
W76-05376

INVESTIGATIONS OF SUB-ICE BEDROCK CHARACTERISTICS BY RADIO-ECHO SOUNDING,
Scott Polar Research Inst., Cambridge (England).
G. K. A. Oswald.
In: Symposium on Remote Sensing in Glaciology; Proceedings of the third symposium on glaciology, Cambridge (England), September 16-20, 1974. Journal of Glaciology, Vol. 15, No. 73, p 75-87, 1975. 10 fig, 1 tab, 6 ref.

Descriptors: *Ice, *Glaciers, *Remote sensing, *Antarctic, Radar, Sounding, Aircraft, Bedrock, Lakes, Analytical techniques, Glaciology.
Identifiers: *Radio-echo soundings.

Qualitative inspection of the results of the 1971-72 Scott Polar Research Institute-National Science Foundation Antarctic radio-echo sounding program showed that it is possible to infer some characteristics of the lower face of the ice from the form of received echoes. The existence of lakes of liquid water beneath the east Antarctic ice was confirmed by inspection of the top and bottom surface gradients of the ice, and it was suggested that basal melting occurs over a wide area in this region. Quantitative studies in Devon Island indicated that small-scale irregularities in the bedrock are characterized by slopes of about 1 : 40, with some higher gradients present, possibly indicating the presence of morainal boulders. It was deduced that a geological boundary was crossed between 25 and 40 km west of the base camp, the rock to the west of the boundary having lower permittivity and higher surface slopes than that to the east. The question of the usefulness of the spatial fading of the echo in deducing surface characteristics was briefly discussed. It was concluded that measurements of the fading are indeed useful, especially in the case of echoes with short 'tails'. (See also W76-05372) (Sims-ISWS)
W76-05377

GLACIER SLIDING MEASURED BY A RADIO-ECHO TECHNIQUE,
Scott Polar Research Inst., Cambridge (England).
British Antarctic Survey, London (England).
C. S. M. Doake.
In: Symposium on Remote Sensing in Glaciology; Proceedings of the third symposium on glaciology, Cambridge (England), September 16-20, 1974. Journal of Glaciologyl, Vol. 15, No. 73, p 89-93, 1975. 1 fig, 2 tab, 5 ref.

Descriptors: *Glaciers, *Remote sensing, *Velocity, *Antarctic, Radar, Aircraft, Sounding, Surveys, Ice, Bedrock, Analytical techniques, Glaciology.
Identifiers: *Radio-echo soundings, Glacier sliding.

An attempt to measure the surface velocity of a glacier by observing radio-echo fading patterns appears to have yielded instead a measure of the bottom sliding velocity. The basal sliding of a glacier more than 1,000 m thick was measured by observations from the surface. The sliding velocity was inferred from the difference between apparent surface velocities measured by two different techniques. The true surface velocity was determined by classical optical surveying using fixed marks on surrounding mountains. A radio-echo technique gave the surface velocity relative to a

reflecting layer for radio waves near the ice-bedrock boundary. The difference between these velocities gave the motion of the reflecting layer relative to the glacier bedrock. While the radio-echo method of measuring ice surface velocities may give false values in areas where basal sliding occurs, where true velocity can be checked by other means the technique appears valuable for learning about conditions near the base of the ice. (See also W76-05372) (Sims-ISWS)
W76-05378

LAYER ECHOES IN POLAR ICE SHEETS,
Technical Univ. of Denmark, Lyngby. Inst. of Electromagnetics.
P. Gudmandsen.
In: Symposium on Remote Sensing in Glaciology; Proceedings of the third symposium on glaciology, Cambridge (England), September 16-20, 1974. Journal of Glaciology, Vol. 15, No. 73, p 95-101, 1975. 3 fig, 9 ref.

Descriptors: *Ice, *Glaciers, *Remote sensing, Radar,Sounding, Aircraft, Bedrock, Analytical techniques, Glaciology.
Identifiers: *Radio-echo soundings, *Greenland, Ice layers.

A multitude of extensive layers have been observed by radio-echo soundings in Greenland. By comparison with the stable isotope profile from Camp Century, it was found that layering in the top of the ice has been formed in the period since the last glaciation. Radio-echo layers observed at greater depths in central Greenland may have been created in the period of the interstadials and further down possibly in the period prior to the last glaciation. Further investigations are needed to prove this. (See also W76-05372) (Sims-ISWS)
W76-05379

RADIO-ECHO SOUNDING OF THE LAMBERT GLACIER BASIN,
Department of Sciences, Melbourne (Australia). Antarctic Div.
V. I. Morgan, and W. F. Budd.
In: Symposium on Remote Sensing in Glaciology; Proceedings of the third symposium on glaciology, Cambridge (England), September 16-20, 1974. Journal of Glaciology, Vol. 15, No. 73, p 103-111, 1975. 7 fig, 1 tab, 9 ref.

Descriptors: *Glaciers, *Ice, *Remote sensing, *Antarctic, Aircraft, Ice cover, Radar, Sounding, Bedrock, Geology, Mountains, Glaciology.
Identifiers: *Radio-echo soundings, *Lambert glacier basin(Antartica), *Ice thickness.

Several seasons of aerial ice-thickness soundings over the region of the Prince Charles Mountains, the Lambert Glacier system, the Amery Ice Shelf, and their drainage basin in east Antarctica have now been completed. The measurements provided detailed maps of surface topography and ice thickness over an area of about 200,000 sq km. The equipment used consisted of a 100 MHz echo sounder carried in a Pilatus Porter aircraft. ERTS imagery provided a valuable background for portraying the echo-sounding results. These results showed that an extensive, deep subglacial valley system forms the basis of the large drainage basin with concave ice surface topography which channels the ice flow into the Amery Ice Shelf. Deep glacial streams penetrate a long way into the ice-sheet basin. The rock relief is considerable, varying from 3,000 m above (present) sea-level to 2,000 m below sea-level. A very deep subglacial trench exists in the region of the confluence of the Fisher, Mellor, and Lambert Glaciers where the ice thickness reaches 2,500 m. The low surface slope and high ice velocity are suggestive of high melt production in this region. The strong echo, together with the high bedrock back-slope, suggests that the deep trench may contain a basal melt lake. (See also W76-05372) (Sim-ISWS)
W76-05380

ADVANCES IN GEOPHYSICAL EXPLORATION OF ICE SHEETS AND GLACIERS,
Wisconsin Univ., Madison. Dept. of Geology and Geophysics; Wisconsin Univ., Madison. Geophysical and Polar Research Center.
C. R. Bentley.
In: Symposium on Remote Sensing in Glaciology; Proceedings of the third symposium on glaciology, Cambridge (England), September 16-20, 1974. Journal of Glaciology, Vol. 15, No. 73, p 113-135, 1975. 18 fig, 51 ref.

Descriptors: *Glaciers, *Ice, *Exploration, *Geophysics, Seismic studies, *Remote sensing, Borehole geophysics, Investigations, Sounding, Radar, Ice cover, Anisotropy, Physical properties, Glaciology.
Identifiers: *Radio-echo soundings.

The techniques of geophysical exploration can be used in a number of ways to investigate the internal characteristics of ice bodies. Anisotropy resulting from nonrandom ordering of crystal axes produces effects on seismic wave propagation speeds measurable by both refraction and reflection techniques. The effects on shear waves are particularly strong, so the recent development of an effective shear-wave generator should prove very useful. Marked effects on radio-wave polarizations have also been noted, but are not readily interpretable because the anisotropic dielectric characteristics of single-crystal ice in the radio-echo frequency range are not yet known. Elastic internal friction can be determined by careful measurements of seismic-wave amplitudes. Dielectric properties of the ice can be found from VLF propagation experiments and electrical logging in drill holes as well as from the radio-echo sounding techniques. An activation energy can be estimated from d.c. resistivity measurements where the temperature profile is known. Recent developments have led to much improved methods of determining density-depth variations and long-term mean annual snow accumulation rates from seismic refraction shooting. (See also W76-05372) (Sims - ISWS)
W76-05381

COMPARISON OF ELECTROMAGNETIC AND SEISMIC-GRAVITY ICE THICKNESS MEASUREMENTS IN EAST ANTARCTICA,
Scott Polar Research Inst., Cambridge (England).
For primary bibliographic entry see Field 7B.
W76-05382

VELOCITY OF RADIO WAVES IN ICE BY MEANS OF A BORE-HOLE INTERFEROMETRIC TECHNIQUE,
Scott Polar Research Inst., Cambridge (England).
For primary bibliographic entry see Field 7B.
W76-05383

ULTRASONIC PROPERTIES OF PLASTICALLY DEFORMED ICE,
Institut National des Sciences Appliquees Lyon (France). Laboratoire de Physique des Materiaux.
J. Tatibouet, R. Vassoille, and J. Perez.
In: Symposium on Remote Sensing in Glaciology; Proceedings of the third symposium on glaciology, Cambridge (England), September 16-20, 1974. Journal of Glaciology, Vol. 15, No. 73, p 161-169, 1975. 8 fig, 19 ref.

Descriptors: *Ice, *Sound waves, *Ultrasonics, *Attenuation, Properties, Mechanical properties, Laboratory tests, Crystallography, Temperature, Deformation, Plastic deformation, Strain.

Many investigators have used propagation of ultrasonic waves in ice for glaciological studies. This propagation is characterized by the velocity of sound and by the attenuation of stress waves. In crystalline materials, these two characteristics depend on structural state. In particular, plastic deformation gives velocity and attenuation variations. The sound velocity and attenuation of ultrasonic waves were measured in strained specimens of ice (single crystals and polycrystals). These measurements, done between 100 and 273 K at a frequency of 5 MHz, showed that plastic deformation leads to an increase of attenuation and an increase of velocity. Annealing treatments at 271 K caused recovery of propagation characteristics. The variation in attenuation can be interpreted by the theory of dislocations. This interpretation was supported by data on the influence of frequency on this increase of attenuation induced by plastic deformation, but the theory of dislocations implies a decrease of modulus, i.e., of velocity, hence it was postulated that an added phenomenon screens the effect of dislocations. That phenomenon could be connected with ageing effects observed on different physical properties of ice and may be due to modification of protonic arrangement or creation of interstitials during plastic deformation. (See also W76-05372) (Sims - ISWS)
W76-05384

APPLICATION OF RADAR TECHNIQUES TO ICE AND SNOW STUDIES,
Communications Research Centre, Ottawa (Ontario).
For primary bibliographic entry see Field 7B.
W76-05385

INTERPRETATION OF SLAR IMAGERY OF SEA ICE IN NARES STRAIT AND THE ARCTIC OCEAN,
Defence Research Establishment, Ottawa (Ontario).
For primary bibliographic entry see Field 7B.
W76-05386

SEA-ICE RECONNAISSANCE BY RADAR,
Hokkaido Univ., Sapporo (Japan). Inst. of Low Temperature Science.
For primary bibliographic entry see Field 7B.
W76-05387

COMPARISON OF SEA-ICE TYPE IDENTIFICATION BETWEEN AIRBORNE DUAL-FREQUENCY PASSIVE MICROWAVE RADIOMETRY AND STANDARD LASER/INFRARED TECHNIQUE,
Naval Oceanographic Office, Washington, D.C.
For primary bibliographic entry see Field 7B.
W76-05388

TEMPERATURE MEASUREMENT OF ICE AND WATER SURFACES IN THE NORTH WATER AREA USING AN AIRBORNE RADIATION THERMOMETER,
Eidgenossische Technische Hochshule, Zurich (Switzerland). Geographisches Institut.
For primary bibliographic entry see Field 7B.
W76-05389

THE ANALYSIS OF THE NEAR-SURFACE ENERGY TRANSFER ENVIRONMENT FROM THERMAL INFRARED IMAGERY,
Michigan Univ., Ann Arbor. Dept. of Geography.
For primary bibliographic entry see Field 7B.
W76-05390

SIGNIFICANCE OF SURFACE TEMPERATURE IN THE THERMAL INFRARED SENSING OF SEA AND LAKE ICE,
Army Engineer Topographic Labs., Fort Belvoir, Va. Center for Remote Sensing.
For primary bibliographic entry see Field 7B.
W76-05391

SEASONAL EFFECTS ON GROUND-WAVE PROPAGATION IN COLD REGIONS,
Research Inst. of National Defence, Stockholm (Sweden).
For primary bibliographic entry see Field 7B.
W76-05392

CHARACTERIZATION OF COLD-REGIONS TERRAIN USING AIRBORNE LASER PROFILOMETRY,
Cold Regions Research and Engineering Lab., Hanover, N. H.
For primary bibliographic entry see Field 7B.
W76-05393

A SUBMARINE SONAR STUDY OF ARCTIC PACK ICE,
Scott Polar Research Inst., Cambridge (England).
For primary bibliographic entry see Field 7B.
W76-05394

OPTICAL PROPERTIES OF SALT ICE,
Cold Regions Research and Engineering Lab., Hanover, N. H.
J. W. Lane.
In: Symposium on Remote Sensing in Glaciology; Proceedings of the third symposium on glaciology, Cambridge (England), September 16-20, 1974. Journal of Glaciology, Vol. 15, No. 73, p 363-372, 1975. 6 fig, 12 ref.

Descriptors: *Ice, *Optical properties, *Laboratory tests, Salinity, Opacity, Light, Bubbles, Salts, Instrumentation.
Identifiers: *Light transmission, Extinction coefficient, *Salt ice.

The dependence of the extinction coefficient on salinity was investigated for both NaCl-ice and salt-ice made from natural sea-water. Specimens were prepared under a variety of conditions and examined over the wavelength range 4,000 to 8,000 angstroms. The effects of scattering from air bubbles trapped in the ice were examined for ice made from distilled water. It was found that the method of preparing samples markedly affected their structure, but that, when prepared in the same manner, salt-ice made from natural sea-water and NaCl-ice did not show significantly different transmission properties. It was found that, for a wavelength of 6,328 angstroms, the extinction coefficient could be related to the salinity of the ice within an uncertainty of 26%. Within an uncertainty of 10%, there was no variation in transmission for ice at the same temperature and salinity over the wavelength range 4,000 to 8,000 angstroms. All measurements were made at a temperature of -20 C. (See also W76-05372) (Sims-ISWS)
W76-05395

SATELLITES--NEW GLOBAL OBSERVING TECHNIQUES FOR ICE AND SNOW,
National Aeronautics and Space Administration, Greenbelt, Md. Goddard Space Flight Center.
For primary bibliographic entry see Field 7B.
W76-05396

ERTS DATA IN GLACIOLOGY--AN EFFORT TO MONITOR GLACIER MASS BALANCE FROM SATELLITE IMAGERY,
Norges Vassdrags- og Elektrisitetsvesen, Oslo.
For primary bibliographic entry see Field 7B.
W76-05397

ANTARCTIC SEA-ICE VARIATIONS FROM SATELLITE SENSING IN RELATION TO CLIMATE,
Department of Science, Melbourne (Australia). Antarctic Div.
For primary bibliographic entry see Field 7B.
W76-05398

THE USE OF ERTS PHOTOGRAPHS TO MEASURE THE MOVEMENT AND DEFORMATION OF SEA ICE,
Bristol Univ. (England). H. H. Wills Physics Lab.
For primary bibliographic entry see Field 7B.
W76-05399

GENERAL DISCUSSION, THE STATE OF THE ART--AND WHERE DO WE GO FROM HERE.
In: Symposium on Remote Sensing in Glaciology; Proceedings of the third symposium on glaciology, Cambridge (England), September 16-20, 1974. Journal of Glaciology, Vol. 15, No.73, p 437-453, 1975. 2 fig, 7 ref.

Descriptors: *Remote sensing, *Glaciers, *Ice, *Snow, Satellites(Artificial), Radar, Aircraft, Aerial photography, Microwaves, Permafrost, Sea ice, Data storage and retrieval, Data processing, Equipment, *Reviews.

The final session of the symposium was devoted to a 'brain-storming' general discussion of remote sensing of ice and snow. The session chairman divided the discussion into four sub-topics: (1) snow, (2) glaciers and ice sheets, (3) floating ice, and (4) ground ice. Various participants were asked to begin the discussion of each of these subtopics with a list of what they as users would like remote sensing to provide. After these discussions, there were a few comments relating to problems of data storage and retrieval, and new developments in remote sensing equipment. (See also W76-05372) (Sims - ISWS)
W76-05400

CHEMICAL SORTING EFFECT AT THE BASE OF AN ALPINE GLACIER,
Brussels Univ. (Belgium). Laboratoire de Geomorphologie.
R. A. Souchez, and R. D. Lorrain.
Journal of Glaciology, Vol. 14, No. 71, p 261-265, 1975. 1 fig, 1 tab, 10 ref.

Descriptors: *Glaciers, *Chemistry, *Mud-water interfaces, Mud, Chemical properties, *Ion exchange, Cations, Cation exchange, Ions, Chemicals, Electrolytes, Groundwater, Connate water, Cold regions, Alpine, Glaciology.
Identifiers: *Glacier d'Argentiere(Western Alps).

A frozen mud layer plastered at the base of the Glacier d'Argentiere in the Western Alps acts as an ion-exchange membrane for the interstitial water passing through it, causing electrolyte filtration and relative retardation of cations. This interstitial water, which is forced under a pressure gradient of about 3 bar/cm, refreezes in the form of ice accretions. A comparison of the chemical composition of these ice accretions and water held at their surface (corresponding to the situation after the forcing) and the water in contact with the mud layer (corresponding to the situation before the forcing) showed a desalinating effect, a monovalent-diavalent cation species separation, and a sorting effect between the alkalies as well as between the alkaline-earths. This phenomenon has to be taken into account in the study of the chemical composition of stratified ice containing interbedded mud layers which occurs in the basal part of several glaciers. (Sims-ISWS)
W76-05403

REMOTE SENSING,
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 7B.
W76-05431

2D. Evaporation and Transpiration

GREAT PLAINS EVAPOTRANSPIRATION BY A RESISTANCE MODEL USING REMOTELY SENSED THERMAL IMAGERY,
Nebraska Univ. Lincoln. Dept. of Agricultural Engineering.
N. J. Rosenberg, K. L. Blad, S. B. Verma, and M. W. Baradas.
Available from the National Technical Information Service, Springfield, Va 22161,as PB-250 454 $6.75, in paper copy, $2.25 in microfiche. Completion Report, Agricultural Meteorology Report 75-3, December 1975, 160 p. OWRT B-028-NEB(1) 14-310001-4146.

Descriptors: *Boundary layers, *Evapotranspiration, *Remote sensing, Heat resistance, Infrared radiation, Thermal radiation, Crops, Nebraska, Model studies, Kansas, Measurement, Instrumentation, *Great Plains, Soybeans, Sorghum.
Identifiers: *Resistance models, *Thermal imagery, Millet.

The objectives of this project conducted in cooperation with the Kansas State University Evapotranspiration Laboratory were: (1) to test the utility of a resistance model for estimating evapotranspiration rates over large areas; (2) to determine the feasibility of obtaining ground and crop temperature data by remote sensing with infrared thermometry and the accuracy achievable by these means; and (3) to quantify the boundary layer resistance to diffusion as a function of crop height, crop roughness and wind speed. Resistance models were tested in an extensive set of experiments conducted at Manhattan, Kansas using soybeans and sorghum; Mead, Nebraska using sorghum; and Scottsbluff, Nebraska using millet. The three stations were equipped with precision weighing lysimeters which provide a standard measure of actual ET against which the models can be compared. A specially equipped aircraft of the Remote Sensing Institute of South Dakota State University at Brookings overflew the experimental fields on a number of occasions to provide thermal imagery of the crops.
W76-05179

2E. Streamflow and Runoff

A PROPOSED INDEX FOR COMPARING HYDROGRAPHS,
Maryland Univ., College Park. Dept. of Civil Engineering.
For primary bibliographic entry see Field 2A.
W76-05157

BAYESIAN GENERATION OF SYNTHETIC STREAMFLOWS.
Resource Analysis, Inc., Cambridge, Mass.
For primary bibliographic entry see Field 2A.
W76-05271

A BAYESIAN APPROACH TO ANALYZING UNCERTAINTY AMONG FLOOD FREQUENCY MODELS,
International Inst. for Applied Systems Analysis, Laxenburg (Austria).
E. F. Wood, and I. Rodriguez-Iturbe.
Water Resources Research, Vol. 11, No. 6, p 839-843 December 1975. 4 fig, 11 ref. OWRT C-4118 (9021) (12). OWRT 14-31-0001-9021.

Descriptors: *Statistical models, *Flood frequency, *Mathematical studies, *Model studies, Streamflow forecasting, Monte Carlo method, Probability, *Risks.
Identifiers: *Bayesian analysis, *Model uncertainty, *Flood frequency models, Probability models, Normal process model, Log normal process model, Exceedance model.

The statistical uncertainty resulting from the lack of knowledge of which model represents a given stochastic process was analyzed. This analysis of model uncertainty led to a composite Bayesian distribution. The composite Bayesian distribution is a linear model of the individual Bayesian probability distributions of the individual models weighted by the posterior probability that a particular model is the true model. The composite Bayesian probability model accounts for all sources of statistical uncertainty, both parameter uncertainty and model uncertainty. This model is the one one that should be used in applied problems of decision analysis, for it best represents the knowledge, or lack of it, to the decision maker about future events of the process. (Morris-ISWS)
W76-05272

RESISTANCE TO FLOW IN A COMBINED CHANNEL,
Oklahoma State Univ., Stillwater. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 8B.
W76-05273

MEAN ANNUAL RUNOFF IN CENTRAL ASIA AND WESTERN KAZAKH DESERTS, (IN RUSSIAN),
Desert Inst., Ashkhabad (USSR).
G. T. Leshchinskii.
Probl Osvoeniya Pustyn'. 3: 43-49, 1974.

Descriptors: *Runoff, *Annual, *Deserts, Asia, Precipitation(Atmospheric), Clays, *Watersheds(Basins).
Identifiers: *USSR(Central Asia), *USSR(Western Kayakostan).

The mean annual runoff in clayish catchment areas is 5000-35000 m3/km2 in the deserts of Middle Asia and Western Kazakhstan USSR. It increases with excessive precipitation; in years with negligible precipitation, it decreases, or is completely absent.--Copyright 1975, Biological Abstracts, Inc.
W76-05304

FLOOD PROFILES AND INUNDATED AREAS ALONG THE DESCHUTES RIVER, WASHINGTON,
Geological Survey, Tacoma, Wash.
J. R. Williams.
Open-file report 75-395, 1976. 35 p, 17 fig, 3 tab.

Descriptors: *Flood profiles, *Flood data, *Streamflow, *Flood plains, *Washington, Flood peak, Flood recurrence interval, Flow measurement, Gaging stations, Runoff, Flood frequency, Hydrographs, Hydrologic data.
Identifiers: *Deschutes River(Wash), Inundated areas.

Flood profiles on the Deschutes River, Washington, from 2.2 miles to 40.7 miles upstream from the mouth were developed as part of a cooperative program with the State of Washington, Department of Ecology, to identify areas subject to flooding. Flood-frequency analyses, based on 25 years of record at one gaging station and 19 years of record at another, indicate that the 100-year flood would have a discharge of about 9,070 cfs at river mile 25.9 and a discharge of about 10,000 cfs at river mile 3.4. The highest flood discharge during the period of record (1949-present) occurred January 15, in 1974, and was 7,780 cfs at river mile 25.9. The estimated recurrence interval of this flood is 45 years. Estimated water-surface elevations during a 100-year flood indicate that virtually all of the flood plain would be inundated. (Woodard-USGS)
W76-05415

REPORT OF THE ANNUAL YIELD OF THE ARKANSAS RIVER BASIN FOR THE ARKANSAS RIVER BASIN COMPACT, ARKANSAS--OKLAHOMA,
Geological Survey, Little Rock, Ark.
For primary bibliographic entry see Field 4A.
W76-05416

A METHOD FOR ESTIMATING MAGNITUDE AND FREQUENCY OF FLOODS IN MONTANA,
Geological Survey, Helena, Mont.
For primary bibliographic entry see Field 4A.
W76-05422

ANNUAL MAXIMUM STAGES AND DISCHARGES OF NORTH CAROLINA STREAMS,
Geological Survey, Raleigh, N. C.
For primary bibliographic entry see Field 7C.
W76-05423

GEOHYDROLOGIC RECONNAISSANCE AND MEASUREMENT OF PERENNIAL STREAMS CROSSING OUTCROPS OF THE MADISON LIMESTONE, NORTHEASTERN WYOMING, 1974,
Geological Survey, Cheyenne, Wyo.
F. C. Boner, G. C. Lines, M. E. Lowry, and J. E. Powell.
Open-file report 75-614, January 1976. 63 p 2 fig, 1 plate, 4 tab, 4 ref.

Descriptors: *Hydrogeology, *Streamflow, *Perennial streams, *Wyoming, Gaging stations, Stream gages, Flow measurement, Data collections, Geologic formations, Properties, Limestones.
Identifiers: *Madison Limestone outcrops(Wyo).

During the summer of 1974, a geohydrologic field reconnaissance was made of 55 perennial streams crossing outcrops of the Madison Limestone of Mississippian age in the Power River structural basin in northeastern Wyoming. Areas investigated were the Laramie Mountains, the Bighorn Mountains, the Hartville Uplift, and the Black Hills Uplift. Following the reconnaissance, 32 gaging stations were established to monitor streamflow. Miscellaneous discharge measurements were obtained on ungaged streams three times during the summer and fall of 1974. The report summarizes the geohydrology for each area, lists the discharge measurements made through early December 1974, and lists the locations of gaging station and miscellaneous discharge measurement sites. (Woodard-USGS)
W76-05425

HYDROLOGIC UNIT MAP--1974, CARIBBEAN REGION.
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 7C.
W76-05430

2F. Groundwater

GEOHYDROLOGY OF KARST TERRAIN, LOST RIVER WATERSHED, SOUTHERN INDIANA,
Indiana Univ., Bloomington, Water Resources Research Center.
R. V. Ruhe.
Available form the National Technical Information Service, Springfield, Va. 22161, as PB-250 117, $5.00 in paper copy, $2.25 in microfiche. Report of Investigation No. 7, December 1975. 91 p, 28 fig, 7 tab, 45 ref. OWRT C-3122(No. 3689)(1).

Descriptors: *Geomorphology, *Groundwater, *Karst, Soils, Surface waters, Backwater, Corrosion, Discharge(Water), Drainage, Dyes, *Evapotranspiration, Flood frequency, Ions, Sinks, *Soil moisture, Soil water, Subsurface flow, Tracers, Transmissivity, Watershed(Basins), *Indiana, *Hydrogeology, Water chemistry.
Identifiers: *Lost River Watershed(Ind), Southern Indiana.

Geomorphology, soils, bedrock, and surface- and ground-water hydrology were modeled and systems analyzed. Subwatersheds were defined by drainage nets and dye-traced subsurface conduits. Hydrologic response to storm events varies from wetter to drier and transitional seasons; flood frequencies, flows of surface-subsurface water systems, and watershed and subwatershed budgets were analyzed. Evapotranspiration was determined by neutron-probe measurements of soil moisture in model unit cells. In the surface-subsurface-resurgence flow systems, an imbalance occurs frequently. Backwater conditions develop in the conduits causing poorer drainage of the systems. Water levels in sinkholes fluctuate rapidly and greatly in response to rainfall. The transmissivity to bedrock was modeled. Ion concentrations in surface and conduit waters generally vary inversely with discharge. The hydrochemical systems change from a Ca-Mg-HC03-S04 to a Ca-HC03 mix from low to high discharges. Soil water is a low Ca-low Mg-HC03 mix. Bedrock is the major contributor of ions to ground-water. Corrosion in the watershed can be quantified. Problems in planning for watershed protection and flood prevention are identified.
W76-05004

NUMERICAL SIMULATION OF SALT-WATER INTRUSION IN COASTAL AQUIFERS, PART 1,
Princeton Univ., N. J. Dept. of Geological and Geophysical Sciences.
For primary bibliographic entry see Field 5B.
W76-05010

NUMERICAL SIMULATION OF SALT-WATER INTRUSION IN COASTAL AQUIFERS, PART 2,
Princeton Univ., N. J. Dept of Geophysical Sciences.
For primary bibliographic entry see Field 5B.
W76-05011

PUBLIC GROUNDWATER SUPPLIES IN CHAMPAIGN COUNTY,
Illinois State Water Survey, Urbana.
For primary bibliographic entry see Field 4B.
W76-05130

PUBLIC GROUNDWATER SUPPLIES IN CALHOUN COUNTY,
Illinois State Water Survey, Urbana.
For primary bibliographic entry see Field 4B.
W76-05131

PUBLIC GROUNDWATER SUPPLIES IN MASSAC COUNTY,
Illinois State Water Survey, Urbana.
For primary bibliographic entry see Field 4B.
W76-05132

EXPANSION OF SALT-WATER ZONE DUE TO WELL DISCHARGE,
North Carolina State Univ., Raleigh. Dept. of Civil Engineering.
For primary bibliographic entry see Field 2L.
W76-05133

WATER FLOW THROUGH A MULTILAYER STRATIFIED HILLSIDE,
Florida Univ., Gainesville. Dept. of Soil Science.
H. M. Selim.
Water Resources Research, Vol. 11, No. 6, p 949-957, December 1975. 13 fig, 3 tab, 11 ref. OWRT A-026-FLA(6).

Descriptors: *Groundwater movement, *Stratification, *Mathematical models, Equations, Aquifers, Beds, Hydraulic conductivity, Saturated flow, Groundwater potential, Boundary layers, Depth, Ponds, Flow nets, Seepage, Flow rates, Potentiometric level, Subsurface runoff, Slopes.
Identifiers: *Multilayered aquifers, Hillsides, Flow region, Streamlines, Stream functions.

The objective of this study was to present a mathematical analysis for steady state saturated flow through multilayer stratified hillsides of semi-infinite depth. Two soil surface shapes were considered: a constant soil surface slope and a surface of arbitrary shape. Potential and stream functions were obtained for one-, two-, and three-layered hillsides. The method of solution was based on the Gram-Schmidt orthonormalization method. For two-layered hillsides the hydraulic conductivities considered were K sub 1 : K sub 2 = 1:10 and 10:1. For three-layered hillsides the hydraulic conductivities were K sub 1 : K sub 2 : K sub 3 = 1:10:1 and 10:1:10. Flow nets, seepage velocities, and flow rates were presented. These results were useful particularly with regard to subsurface flow, runoff, erosion, and solute movement through sloping soils. (Visocky-ISWS)
W76-05134

INFLUENCE OF SURFACE ACTIVE AGENTS ON MOVEMENT OF WATER IN SOIL,
Regional Inst. of Tech., Jamshedpur (India). Dept. of Chemistry.
For primary bibliographic entry see Field 2G.
W76-05154

TRANSFORMATIONS OF FLUXES AND FORCES DESCRIBING THE SIMULTANEOUS TRANSPORT OF WATER AND HEAT IN UNSATURATED POROUS MEDIA,
Agricultural Research Service, Riverside, Calif.
P. A. C. Raats.
Water Resources Research, Vol. 11, No. 6, p 938-942, December 1975. 18 ref.

Descriptors: *Subsurface flow, *Porous media, *Heat transfer, *Analytical techniques, *Groundwater, Unsaturated flow, Mathematical studies, Equations, Hydrothermal studies, Temperature, Thermal water, Heat, Diffusivity.
Identifiers: *Multiphase flow, Onsager relations, Phase change, Heat and water transport, Meixner's theorem.

Balances of mass for the water in n distinct phases and a balance of heat for the medium as a whole were formulated. Following Philip and de Vries, it was assumed that the flux of water in each phase is proportional to the gradient of the pressure in that phase and that the diffusive component of the flux of heat is proportional to the gradient of the temperature. Clapeyron equations were used to express the gradient of the pressure in any phase in terms of the gradient of the pressure in a reference state and of the temperature. The reference state may be the water in one of the phases or the water in some measuring device such as a tensiometer or a psychrometer. Expressions for the total flux of water and for the diffusive flux of heat plus the convective flux of heat associated with the conversion from any phase to the reference state were shown to satisfy the Onsager reciprocal relations. A theorem due to Meixner was used to delineate the class of fluxes and forces that preserves these relations. In particular, it was shown that if the gradients of water content and temperature are used as the driving forces, the Onsager relations are no longer satisfied. (Prickett-ISWS)
W76-05159

GUIDELINES FOR THE SELECTION OF TURBINE PUMP MATERIALS FOR USE IN GROUNDWATERS,
Queensland Univ., Brisbane (Australia). Dept. of Chemical Engineering.
For primary bibliographic entry see Field 8G.
W76-05406

STRATIGRAPHIC AND HYDROLOGIC RELATIONSHIP OF THE PINEY POINT AQUIFER AND THE ALLOWAY CLAY MEMBER OF THE KIRKWOOD FORMATION IN NEW JERSEY,
Geological Survey, Mineola, N.Y.
B. Nemickas, and L. D. Carswell.
Journal of Research of the U S Geological Survey, Vol 4, No 1, p 1-7, January-February 1976. 8 fig, 2 tab, 13 ref.

Descriptors: *Aquifer characteristics, *Geologic formations, *New Jersey, *Groundwater resources, *Water quality, Hydrogeology, Water wells, Water yield, Water supply, Chemical analysis, Petrology, *Stratigraphy.
Identifiers: *Piney Point aquifer(NJ).

Coarse quartzose (clastic) sediments of middle and late Eocene age in the subsurface of southern New Jersey are identified in this report as the Piney Point aquifer. The sediments are as thick as 220 feet and form a freshwater aquifer which is laterally continuous with the Piney Point aquifer of the Delmarva Peninsula. The Alloway Clay Member, the basal unit of the Kirkwood Formation, rests on the Piney Point aquifer. Where present, it acts as a confining unit for the Piney Point aquifer in southern New Jersey. Chemical analyses of water samples from the Piney Point aquifer in Cumberland County indicate a potential chloride problem in the aquifer near Delaware Bay. A water sample taken in 1973 at the Gandys Beach well contained 516 milligrams per litre of chloride, and a water sample taken in 1973 at the Money Island Marina well contained 73 milligrams per litre of chloride. Scant water-level data indicate the possibility of declining water levels in Cumberland County near Delaware Bay due to pumping from the Piney Point aquifer in Delaware. (Woodard-USGS)
W76-05412

GROUND WATER DEVELOPMENT AND POTENTIAL IN WADIS KHULAYS AND FATIMAH, SAUDI ARABIA,
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 4B.
W76-05419

WATER-LEVEL RECORDS FOR THE NORTHERN HIGH PLAINS OF COLORADO, 1972-76,
Geological Survey, Denver, Colo.
For primary bibliographic entry see Field 7C.
W76-05420

GROUND-WATER DATA NEAR THE NORTHWEST SHORE OF TOPAZ LAKE, DOUGLAS COUNTY, NEVADA,
Geological Survey, Carson City, Nev.
For primary bibliographic entry see Field 7C.
W76-05424

2G. Water In Soils

GEOHYDROLOGY OF KARST TERRAIN, LOST RIVER WATERSHED, SOUTHERN INDIANA,
Indiana Univ., Bloomington, Water Resources Research Center.
For primary bibliographic entry see Field 2F.
W76-05004

PHOSPHORUS MOVEMENT IN SOILS: THEORETICAL ASPECTS,
Cleveland State Univ., Ohio. Dept. of Chemical Engineering.
For primary bibliographic entry see Field 5B.
W76-05048

UNSATURATED FLOW DURING SOIL TREATMENT OF SEPTIC TANK EFFLUENT,
Soil Survey Inst., Wageningen. (Netherlands)
For primary bibliographic entry see Field 5B.
W76-05058

RATES AND MECHANISMS OF CHEMICAL REACTIONS DURING FLOW OF SECONDARY TREATED SEWAGE EFFLUENT THROUGH POROUS BEDS,
California Inst. of Tech., Pasadena.
For primary bibliographic entry see Field 5D.
W76-05103

WATER FLOW THROUGH A MULTILAYER STRATIFIED HILLSIDE,
Florida Univ., Gainesville. Dept. of Soil Science.
For primary bibliographic entry see Field 2F.
W76-05134

INFLUENCE OF SURFACE ACTIVE AGENTS ON MOVEMENT OF WATER IN SOIL,
Regional Inst. of Tech., Jamshedpur (India). Dept. of Chemistry.
D. N. Pathak.
Indian Journal of Technology, Vol. 13, No. 7, p 323-326, July 1975. 4 tab, 11 ref.

Descriptors: *Soil sealants, *Soil stabilization, *Soil treatment, *Permeability, Seepage, Soil water, Capillary action, Sands, Diffusivity, Soil water movement.
Identifiers: *India, Sodium laurate, Soapnut.

Surface active agents, such as soapnut and sodium laurate, have been found to suppress the movement of water in soil. Laboratory experiments with two grades of standard Ennore sands mixed with soapnut and sodium laurate in different proportions showed marked decreases in capillarity, permeability and diffusivity on which the movement of water in a soil mainly depends. A mixture containing 0.3% soapnut on 0.1% sodium laurate gave the best results. The preferential adsorption of colloidal particles formed by the surface active agent on coming in contact with water on the solid surfaces of the soil reduced the movement of water in the soil. (Bhowmik-ISWS)
W76-05154

THE USE OF A DEPENDENT DOMAIN MODEL OF HYSTERESIS IN NUMERICAL SOIL WATER STUDIES,
New South Wales Univ., Kensington (Australia). School of Engineering.
S. J. Lees, and K. K. Watson.
Water Resources Research, Vol. 11, No. 6, p 943-948, December 1975. 4 fig, 19 ref.

Descriptors: *Soil water movement, *Hysteresis, *Unsaturated flow, *Model studies, Numerical analysis, Soil water, Soil pressure, Soil moisture, Moisture content, Infiltration, Moisture tension, Subsurface waters, Recharge, Drainage effects, Mathematical models, Gravitational water.
Identifiers: *Domain models, *Draining curves, *Wetting curves, Finite difference models.

The analysis of intermittent soil water systems requires the inclusion of a capillary hysteresis model in the space-time simulation of the flow process. Domain models of hysteresis were reviewed, and the approach of Poulovassilis and Childs (1971) was selected as the basis for a numerical hysteresis program which enabled the generation of primary, secondary, and higher order scanning curves. The dependence of the pore draining pressure on the pressure at the previous reversal was restricted to reversals from the boundary curves. This enabled the distribution function to be approximated by a series of regularly spaced, independent domain-type distribution diagrams, each being derived from an experimental primary curve and a set of estimated secon-

dary scanning curves. The effectiveness of the approach was demonstrated by simulating the movement of water in a profile of experimental sand subject to intermittent infiltration-redistribution sequences. In particular, the hysteretic path followed by the surface node was used to illustrate the generation of the necessary higher order scanning curves. (Prickett-ISWS)
W76-05158

TRANSFORMATIONS OF FLUXES AND FORCES DESCRIBING THE SIMULTANEOUS TRANSPORT OF WATER AND HEAT IN UNSATURATED POROUS MEDIA,
Agricultural Research Service, Riverside, Calif.
For primary bibliographic entry see Field 2F.
W76-05159

WATER ELUTION OF ORGANIC MATTER IN THE NORTHERN TAIGA FORESTS OF THE KOLA PENINSULA,
For primary bibliographic entry see Field 2K.
W76-05168

COMPARISON OF INORGANIC NITROGEN CONTENTS OF UNDISTURBED, CULTIVATED, AND BARNYARD SOIL PROFILES IN WISCONSIN,
Wisconsin Univ., Madison. Dept. of Soils.
For primary bibliographic entry see Field 5B.
W76-05263

WATER FLUX AND ELECTRICAL POTENTIALS IN WATER-SATURATED BENTONITE,
Purdue Univ., Lafayette, Ind. Agricultural Experiment Station.
S. Gairon, and D. Swartzendruber.
Soil Science Society of America Proceedings, Vol. 39, No. 5, p 811-817, September-October 1975. 6 fig, 1 tab, 8 ref. OWRR B-005-IND(2).

Descriptors: *Zeta potential, Flow, *Hydraulic gradient, *Bentonite, Saturated flow, Clays, Seepage, Permeameters, Hydraulic properties, Hydraulic conductivity, Equipment, Laboratory tests, Hysteresis, Expansive clays.
Identifiers: *Clay-water mixtures, *Streaming potential, *Non-Darcian flow, Swelling clay, Double-layer theory, Electroosmotic back flux.

Electrical potential, water flux, and hydraulic gradient were studied for saturated water flow through plugs of sodium bentonite at concentrations ranging from 11.5 to 35.1% clay. A special permeameter with an adjustable piston allowed measurements to be taken with a given mass of clay, but with successively lower clay concentrations. At the lowest clay content, both electrical potential and water flux increased less than proportionally with increasing hydraulic gradient. This less-than-proportional behavior decreased as clay concentration increased, and, at 28.4% clay, proportional response to hydraulic gradient was obtained for both electrical potential and water flux. A less-than-proportional relationship between electrical potential and hydraulic gradient did not cause the water flux to increase more than proportionally with increasing hydraulic gradient, in contrast with what has been reported for nonswelling quartz powder and would be inferred from the classical double-layer theory of streaming potential and electroosmotic flow. The only indication of a more-than-proportional flux-gradient relationship was found for a 35.1% clay concentration, in the form of a linear relationship displaced to the right from the origin to yield a positive gradient intercept and a negative water flux at zero hydraulic gradient. (Visocky - ISWS)
W76-05269

AGRONIMIC EFFECTS OF THE LAND DISPOSAL OF WASTES FROM THE AGRICULTURAL AND FOOD INDUSTRIES (REPERCUSSIONS AGRONOMIQUES DES EPANDAGES D'EFFLUENTS DES INDUSTRIES AGRICOLES ET ALTIMENTAIRES,
Institut National de la Recherche A Agronomique, Versailles (France). Station Centrale d'Agronomie.
For primary bibliographic entry see Field 5D.
W76-05331

EXPERIMENTAL DETERMINATION OF SOIL MOISTURE ON IRRIGATED LANDS FROM RADIOACTIVE SOIL EMISSION,
N. V. Zotimov.
Soviet Hydrology, Selected Papers, No. 6, p 491-499, 1973. 1 fig, 1 tab, 4 ref, 3 append. Translated from Trudy Gossudarstvennogo Gidrologicheskogo Instituta, No. 207, p 88-93, 1973.

Descriptors: *Soil moisture, *Nuclear moisture meters, *Gamma rays, Radiation, Measurement, Instrumentation, Soil water, Soil moisture meters, Irrigation, Subsurface waters, Moisture, Crops, Agriculture.
Identifiers: *Radioactive soil emission, *USSR.

Successful solution of many practical agricultural production problems requires control of soil moisture dynamics. Obtaining operational data on soil moisture in fields under agricultural use is particularly important for determining irrigation times and rates. The relation between the intensity of the natural gamma radiation of the earth and soil moisture can be used for operational soil moisture determinations on irrigated land. The mean square measurement error of the average moisture content of the upper meter of the soil by the M-100 instrument with a scintillation detector is plus or minus 1% of absolute soil moisture, or plus or minus 3-4% of the relative field moisture capacity of Chernozemic soils. The gamma method of measuring the moisture content of soils from their natural radioactivity does not require soil sampling and laboratory analysis, the installation of sensors in the soil, making trenches in the soil, and the use of artificial radioactive sources. Therefore it increases work efficiency and makes it possible to obtain information on soil moisture directly in the field. (Sims-ISWS)
W76-05401

PREDICTING ANION MOVEMENT IN DISTURBED AND UNDISTURBED SOILS,
North Carolina State Univ., Raleigh. Dept. of Soil Science.
D. K. Cassel, M. T. Van Genuchten, and P. J. Wierenga.
Soil Science Society of America Proceedings, Vol. 39, No. 6, p 1015-1019, November-December 1975. 6 fig, 22 ref.

Descriptors: *Anions, *Ion transport, *Soils, Cores, Laboratory tests, Tracers, Chlorine radioisotopes, Nitrates, Numerical analysis, Mathematical models, Equations, Convection, Diffusion, Nitrification, Soil water, Pore water, Velocity, Depth, Soil texture, Bulk density, Solutes, Loam, *Forecasting.
Identifiers: *Aberdeen loam, *Disturbed soils, *Undisturbed soils, Anionic exclusion, Breakthrough curve.

Prediction of anion displacement in soils has proven difficult owing to anion exclusion and the occurrence of anion sources or sinks within the soil system. In addition, variations in bulk density and texture with depth cause mean pore water velocity and soil water content to be functions of depth. A numerical solution of a modified convective diffusion equation, which accounts for apparent anion exclusion and variations in soil water content and mean pore water velocity as functions of depth, was discussed. Moreover, a zero-order rate term was incorporated to account for nitrification occurring in the upper portion of the soil profile. The model was tested using previously published NO3 and C136 displacement data for disturbed and undisturbed cores of Aberdeen loam. The model predicted C136 displacement well. Incorporation of the source term improved prediction of the nitrate breakthrough curve, but agreement of the predicted curve with observed data was only fair. When average values for water content and bulk density were used throughout the entire column, instead of depth dependent values, the description of anion movement was not as good. It was suggested, however, that the improvement in accuracy of prediction of anion displacement may be less than the variation in solute movement observed among replicate soil cores. (Visocky-ISWS)
W76-05402

LIQUID AND VAPOUR PHASE TRANSPORT IN SOILS,
Massey Univ., Palmerston North (New Zealand). Dept. of Soil Science.
D. R. Scotter.
Australian Journal of Soil Research, Vol. 14, No. 1, p 33-41, February 1976. 6 fig, 26 ref.

Descriptors: *Soil water movement, *Water vapor, *Moisture content, *Diffusivity, Diffusion, Unsaturated flow, Clays, Sands.

Measurements, and calculations from desorption isotherms, for vapour and liquid phase flow in a loamy sand and a clay over a range of water content is reported. At some water contents the measured vapour diffusivities were up to an order of magnitude greater than the calculated values. The liquid and vapour diffusivities were found to be of comparable magnitude over a range of moisture contents. The measured component diffusivities at 298 K were used to calculate total diffusivities at other temperatures, and good agreement was found with measured values. (CSIRO)
W76-05409

COUPLED SOIL MOISTURE, HEAT AND WATER VAPOUR TRANSFERS UNDER SIMULATED FIRE CONDITIONS,
Commonwealth Scientific and Industrial Research Organization, Canberra (Australia). Div. of Plant Industry.
A. R. Aston, and A. M. Gill.
Australian Journal of Soil Research, Vol. 14, No. 1, p 55-66, February 1976. 9 fig, 22 ref.

Descriptors: *Burning, *Soil temperature, *Heat transfer, *Soil water movement, *Water vapor, Evaporation, Moisture content, Numerical analysis, Model studies, Laboratory tests.

An approximate numerical method is presented coupling the transfer of water, heat and water vapour in a soil. The system is used to predict in time, soil temperature profiles under simulated surface fire conditions. Moisture profiles, ground heat flux and soil evaporation are also calculated. An experiment using a tube of moist sand heated by a radiant heater was used to test the model. A further test was imposed using experimental grass fire data from the literature. In all cases deviations between observed and calculated results were small. (CSIRO)
W76-05410

A NOTE ON THE USE OF THE PHILIP INFILTRATION EQUATION,
Commonwealth Scientific and Industrial Research Organization, Canberra (Australia). Div. of Environmental Mechanics.
D. E. Smiles, and J. H. Knight.
Australian Journal of Soil Research, Vol. 14, No. 1, p 103-108, February 1976. 4 fig, 1 table, 10 ref.

Descriptors: *Graphical analysis, *Infiltration, Equations, Mathematical studies, *Soil water movement.
Identifiers: *Philip infiltration equation.

The suggestion is made that, where i is cumulative infiltration to a uniform soil at time t after ponding, data from infiltration experiments should be graphed with (i/square root of t) as a function of (square root of t), as a matter of course. Early-time linearity of this curve confirms the appropriateness during this time of Philip's two-parameter equation. The two parameters emerge as the intercept and slope of the line. If subsequently infiltration is described by the equation di/dt = K (the 'saturated' hydraulic conductivity), then this part will emerge as the asymptote of i = Kt. (CSIRO)
W76-05411

2H. Lakes

EFFECTS OF ARTIFICIAL DESTRATIFICATION ON POPULATIONS OF BENTHIC MACROINVERTEBRATES AND ZOOPLANKTON IN HAM'S LAKE AND ARBUCKLE RESERVOIR,
Oklahoma State Univ., Stillwater, School of Biological Sciences.
For primary bibliographic entry see Field 5C.
W76-05017

AUTOMATED DETERMINATIONS OF DISSOLVED ORGANIC CARBON IN LAKE WATER,
Canada Center for Inland Waters, Burlington, (Ontario).
For primary bibliographic entry see Field 5A.
W76-05047

COMPARATIVE ATOMIC ABSORPTION SPECTROSCOPIC STUDY OF TRACE METALS IN LAKE WATER,
Limnetics, Inc., Milwaukee, Wis.
For primary bibliographic entry see Field 5A.
W76-05051

BOAT-GENERATED WAVES IN LAKES,
Illinois Univ. at Urbana-Champaign. Water Resources Center.
N. G. Bhowmik.
Journal of the Hydraulics Division, Proceedings American Society of Civil Engineers, Vol. 101, No. HY11, p 1465-1468, November 1975. 3 fig, 4 ref. OWRT A-069-ILL(1). USDI 14-31-0001-5013.

Descriptors: *Boating, *Lakes, *Waves(Water), *Illinois, Shores, Shore protection, Energy, Erosion, Erosion control, On-site investigations, Bank stabilization.
Identifiers: *Variance spectra, *Carlyle Lake(111), Wave heights.

Banks of waterways, canals, rivers, or lakes are sometimes exposed to detrimental effects by boat-generated waves. These banks are more vulnerable to any form of wave action whenever the stage is above normal pool elevation. A field study was conducted to gather information about waves produced by a moving boat at various distances from the shore. Statistical analysis indicated that the wave heights can be described to some extent by the Rayleigh distribution. Serial correlation analysis indicated no periodic variation in the boat-generated waves. Variance spectrum analysis indicated that as the distance between the moving boat and the shore diminishes, the exposed shore must dissipate a major portion of the wave energy in a very short period of time. It might be advisable to make a 100-ft (30.5m) strip close to the shore off-limits to high-speed pleasure crafts. This should minimize the damage to the shore by the boat-generated waves. Maximum wave heights can be related to the boat speed, the length of the boat, the distance between the boat and the wave gage, and the draft of the boat.
W76-05128

AN EFFICIENT TRANSITION DEFINITION FOR DISCRETE STATE RESERVOIR ANALYSIS: THE DIVIDED INTERVAL TECHNIQUE,
New South Wales Univ., Kensington (Australia). School of Civil Engineering; and New South Wales Univ., Kensington (Australia). Dept. of Water Engineering.
For primary bibliographic entry see Field 4A.
W76-05161

THE EFFECTS OF A MARSH ON WATER QUALITY,
Hope Coll., Holland, Mich. Dept. of Biology.
For primary bibliographic entry see Field 5G.
W76-05182

NUTRIENT DYNAMICS AND GAS PRODUCTION IN AQUATIC ECOSYSTEMS: THE EFFECTS AND UTILIZATION OF MERCURY AND NITROGEN IN SEDIMENT-WATER MICROCOSMS,
Utah Center for Water Resources Research, Logan.
For primary bibliographic entry see Field 5C.
W76-05246

NATURALLY OCCURRING ORGANIC COMPOUNDS AND ALGAL GROWTH IN A EUTROPHIC LAKE,
Utah Center for Water Resources Research, Logan.
For primary bibliographic entry see Field 5C.
W76-05253

ZOOPLANKTON FORMATION IN THE OCHER BAY OF THE VOTKINSK RESERVOIR, (IN RUSSIAN),
Perm State Univ. (USSR). Natural Sciences Inst.
R. A. Serkina.
Gidrobiol Zh. 10(5): 42-48, 1974.

Descriptors: *Zooplankton, *Reservoirs, Bays, Biomass, Plankton, *Fish food organisms, Fry, Fish, *Coustaceans.
Identifiers: *USSR(Votkinsk Reservoir), Ocher Bay.

Changes in zooplankton of the Ocher river (USSR) (the right tributary of the Kama) are caused by backwater in connection with formation of the reservoir. The process of zooplankton formation in the bay is similar to that in the central part of the reservoir. There was mass development of Cladocera for the 1st 2 yr of the reservoir's existence, then a decrease and, by the 6th yr, a 13-20-fold increase in a summer biomass as compared to the center of the reservoir. The bay, uncontaminated and rich in plankton, supplies food for fish fry.--Copyright 1975, Biological Abstracts, Inc.
W76-05274

THE CAUSE OF TROUT FISH KILLS OCCURRING IN THE WATER FROM THE AERATED HYPOLIMNION OF DEEP LAKES,
Georgia Inst. of Tech., Atlanta. Engineering Experiment Station.
For primary bibliographic entry see Field 5C.
W76-05325

BACTERIAL POLLUTION IN LAKE BURLEY GRIFFIN,
Royal Military Coll., Duntroon (Australia). Dept. of Geography.
For primary bibliographic entry see Field 5C.
W76-05407

EFFECTS OF AIR INJECTION AT PROMPTON LAKE, WAYNE COUNTY, PENNSYLVANIA,
Geological Survey, Harrisburg, Pa.
For primary bibliographic entry see Field 5G.
W76-05413

CHEMICAL QUALITY AND TEMPERATURE OF WATER IN FLAMING GORGE RESERVOIR, WYOMING AND UTAH, AND THE EFFECT ON THE RESERVOIR ON THE GREEN RIVER,
Geological Survey, Salt Lake City, Utah.
E. L. Bolke, and K. M. Waddell.
Water-Supply Paper 2039-A, 1975. 26 p, 8 fig, 1 plate, 1 tab, 9 ref.

Descriptors: *Water quality, *Water temperature, *Reservoirs, *Wyoming, *Utah, Hydrologic data, Pre-impoundment, Post-impoundment, Inflow, Discharge(Water), Water chemistry, Chemical analysis, Anaerobic conditions, Dissolved solids, Thermal properties, Epilimnion, Hypolimnion, Limnology.
Identifiers: *Flaming Gorge Reservoir(Wyo and Utah), Green River.

The major tributaries to Flaming Gorge Reservoir (Wyoming and Utah) contribute an average of about 97 percent of the total streamflow and 82 percent of the total load of dissolved solids. The Green River is the largest tributary, and for the 1957-72 water years it contributed 81 percent of the total streamflow and 70 percent of the total load of dissolved solids. The principal constituents in the tributary streamflow are calcium and sulfate during periods of lowest flow and calcium and bicarbonate during periods of highest flow. Flaming Gorge Dam was closed in November 1962, and the most significant load changes of chemical constituents due to the net effect of inflow, outflow, leaching, and chemical precipitation in the reservoir have been load changes of sulfate and bicarbonate. The average increase of dissolved load of sulfate in the reservoir for the 1969-72 water years was 110,000 tons per year, which was 40,000 tons per year less than for the 1963-66 water years. The average decrease of dissolved load of bicarbonate in the reservoir for 1969-72 was 40,000 tons per year, which was the same as the decrease for 1963-66. Anaerobic conditions were observed in the deep, uncirculated part of the reservoir near the dam during the 1971 and 1972 water years. The water in the reservoir is in three distinct layers, and the upper two layers (the epilimnion and the metalimnion) mixed twice during each of the 1971-72 water years. The two circulation periods were in the spring and fall. The water in the deepest layer (the hypolimnion) did not mix with the waters of the upper zones. Prior to closure of the dam, the average monthly temperature of the green River below the damsite ranged from 0 deg C to 19.5 deg C as compared to 3.5 deg C to 10.0 deg C after closure. (Woodard-USGS)
W76-05417

USER PREFERENCES OF POLICY ALTERNATIVES: THE CASE OF RECREATIONAL USER ATTITUDES TOWARD DEVELOPMENT AND REGULATION AT LAKE MONROE, INDIANA,
Indiana Univ., Bloomington. Poplars Research and Conference Center.
For primary bibliographic entry see Field 6B.
W76-05435

ZOOPLANKTON OF SOME INLAND WATERS OF THE DAGESTAN ASSR., (IN RUSSIAN),
Kaspiiskii Nauchno-Issledovatelskii Institut Rybnogo Khozyaistva, Makhachkala (USSR).
L. P. Lazareva.
Gidrobiol Zh. 10(5): 88-90, 1974.

Descriptors: Zooplankton, *Crustaceans, Inland waterways, Fish, *Rotifers, *Copepods, Lakes, Ponds, Fish hateris, *Fish food organisms.
Identifiers: Copepod, *USSR(Dogestan-ASSR).

Data are presented on the average seasonal biomass of zooplankton (rotifers, cladocerans, copepods) of Lake Ak-Gel, Lake Temirgoe and hatchery ponds of Lake Mekteb (Russian SFSR, USSR), differing in size, physicochemical conditions and fish composition. Copyright 1975, Biological Abstracts,Inc.

W76-05444

SOME PHYSICAL FACTORS AS THE ECOLOGICAL BACKGROUND IN THE PELAGIAL OF THE SOSNOWICKIE LAKES,
Warsaw Univ. (Poland). Zaklad Microbiologica Wody Sci.
For primary bibliographic entry see Field 5C.
W76-05474

ROLE OF CALCIUM CARBONATE PRECIPITATION IN LAKE METABOLISM,
Michigan State Univ., East Lansing. Dept. of Botany.
W. S. White.
Available from the National Technical Information Service, Springfield, Va 22161 as C00-159 980, $6.75 in paper copy, $2.25 in microfiche. PhD thesis, 1974. 154 p. 37 fig, 8 tab, 107 ref.AEC AT (11-1)1599, C00-1599, NSF GB-15665.

Descriptors: *Calcium carbonate, *Sedimentation, *Lakes, *Metabolism, Michigan, Lake sediments, Seston, Hardness(Water), Organic matter, Calcium, Productivity, Phosphorus, Nitrogen, Carbon, Sedimentation rates, Iron, Phytoplankton, Vitamin B.
Identifiers: *Lawrence Lake(Mich), Ash sedimentation, Vitamin B-12.

Sedimenting seston was collected during 1972 and 1973 in improved sediment traps in Lawrence Lake, Michigan, a small hardwater lake. Organic matter and ash sedimentation rates were similar both years, but the calcium carbonate precipitation rate was five times greater in 1973. This dissimilarity in calcium carbonate precipitation was related to the degree of vernal circulation and calcium ion concentration in the water column when the ice broke up. Colloidal calcium was present all year. The average amount of suspended calcium carbonate was 36.7 mg/1. Scanning electron micrographs of seston collected at 10 m showed an organic matrix covering all material and clogging filter pores. Total phosphorus sedimentation showed marked displacement into the metalimnion and hypolimnion when decalcitication was severe in the epilimnion. The amount of material resuspended from the lake bottom varied with strength and duration of vernal and autumnal winds. Nitrogen and particulate organic carbon sedimentation rates were relatively constant and closely related to phytoplankton activity in the trophogenic zone. No direct adsorplion of iron onto calcium carbonate particles was suggested by laboratory experiments, but calcium carbonate and iron precipitation rates were influenced by the presence of organic compounds. Vitamin B-12 was removed with precipitating calcium carbonate. (Buchanan-Davidson--Wisconsin)
W76-05480

2I. Water In Plants

ROOKERY BAY LAND USE STUDIES, ENVIRONMENTAL PLANNING STRATEGIES FOR THE DEVELOPMENT OF A MANGROVE SHORELINE, STUDY NO. 5, ESTUARINE BIOLOGY,
Conservation Foundation, Washington, D. C.
For primary bibliographic entry see Field 5G.
W76-05006

WATER ELUTION OF ORGANIC MATTER IN THE NORTHERN TAIGA FORESTS OF THE KOLA PENINSULA,
For primary bibliographic entry see Field 2K.
W76-05168

ENVIRONMENTAL ANALYSIS OF WATER RESOURCES DEVELOPMENT IN SOUTHWESTERN NORTH DAKOTA,
Dickinson State Coll., N. Dak.
For primary bibliographic entry see Field 6G.
W76-05351

2J. Erosion and Sedimentation

BOAT-GENERATED WAVES IN LAKES,
Illinois Univ. at Urbana-Champaign. Water Resources Center.
For primary bibliographic entry see Field 2H.
W76-05128

MEASUREMENT OF HYDROCARBONS IN WATER AND SEDIMENT,
Esso Research and Engineering Co., Linden, N. J. Analytical and Information Div.
For primary bibliographic entry see Field 5A.
W76-05144

FLUME STUDY OF KNICKPOINT DEVELOPMENT IN STRATIFIED SEDIMENT,
Sydney Univ. (Australia). Dept. of Geography.
W. N. Holland, and G. Pickup.
Geological Society of America Bulletin, Vol. 87, No. 1, p 76-82, January 1976. 8 fig, 2 tab, 6 ref.

Descriptors: *Flumes, *Erosion, Geomorphology, Sedimentation, Sediments, Discharge(Water), Hydraulics, Degradation(Stream), Channel erosion, Channels.
Identifiers: *Flume experiments, *Stratified sediment, Knickpoints, Longitudinal profiles, Cohesive sediment, Retreat rate.

In a flume study of knickpoint development in stratified sediment, two thin sand beds were intercalated between beds of cohesive material. The sand beds acted as knickpoint-forming horizons on which stepped knickpoints were developed and maintained as they moved upstream, creating an apparently stable form consisting of a channel-in-channel system. The system had four basic elements: (1) an aggraded reach upstream of the knickpoint, terminating on the downstream end at a fill-incision transition zone; (2) an oversteepened reach just above the knickpoint face; (3) the knickpoint face; and (4) an incising reach, often covered by moving sediment between successive knickpoints. Apparently the presence of a knickpoint-forming horizon reduces knickpoint retreat rates, which were much lower in this study than those observed in an experiment with cohesive material but no intercalated sand beds and a similar discharge. Also, the channel-in-channel system that results from stratification is apparently fairly insensitive to the effects of changing deischarge. (Lee -ISWS)
W76-05162

BEACH CUSPS FORMED BY INTERSECTING WAVES,
Delaware Univ., Newark. Dept. of Civil Engineering.
For primary bibliographic entry see Field 2L.
W76-05163

RIVERS OF THE PAST: CREATORS OF OIL,
G. V. Obediyentova.
Available from the National Technical Information Service, Springfield, Va, 22161, as N75-10517, $3.50 in paper copy, $2.25 in microfiche. Translated from Russian; Source Publication not given, 22 p, 9 fig, 7 ref.

Descriptors: *Rivers, *Paleohydrology, *Sedimentary petrology, *Oil, Hydrology, Sedimentation, Humus, Alluvium, Deltas, Geology, Hydrogeology.
Identifiers: *USSR, *Volga River(USSR).

The processes were described by which the ancient Volga worked to create the so-called productive strata which contains petroleum. Sediments and humus were carried by the Paleovolga, and created the alluvial deposits at its delta, which have become oil bearing rock formations. (Sims-ISWS)
W76-05166

EFFECTS OF LAND USE AND RETENTION PRACTICES ON SEDIMENT YIELDS IN THE STONY BROOK BASIN, NEW JERSEY,
Geological Survey, Ithaca, N.Y.
For primary bibliographic entry see Field 4C.
W76-05418

2K. Chemical Processes

GEOHYDROLOGY OF KARST TERRAIN, LOST RIVER WATERSHED, SOUTHERN INDIANA,
Indiana Univ., Bloomington, Water Resources Research Center.
For primary bibliographic entry see Field 2F.
W76-05004

EVALUATION OF WATER LABORATORIES, RECOMMENDED BY THE UNITED STATES PUBLIC HEALTH SERVICE.
Public Health Service, Washington, D.C. Bureau of State Services.
For primary bibliographic entry see Field 5G.
W76-05041

INTERFERENCES IN THE ELECTROANALYTICAL DETERMINATION OF COPPER AND LEAD IN WATER AND WASTE WATER,
University of Strathclyde, Glasgow (Scotland). Dept. of Civil Engineering.
For primary bibliographic entry see Field 5A.
W76-05045

POTABLE WATER QUALITY IN RURAL GEORGETOWN COUNTY,
South Carolina State Coll., Orangeburg. Dept. of Natural Sciences.
For primary bibliographic entry see Field 5A.
W76-05050

COMPARATIVE ATOMIC ABSORPTION SPECTROSCOPIC STUDY OF TRACE METALS IN LAKE WATER,
Limnetics, Inc., Milwaukee, Wis.
For primary bibliographic entry see Field 5A.
W76-05051

MODEL 6-D IN-SITU WATER QUALITY ANALYZER (SURVEYOR) HYDROLAB CORPORATION, AUSTIN, TEXAS 78766.
National Oceanic and Atmospheric Administration, Washington, D. C.; and National Ocean Survey, Rockville, Md.
For primary bibliographic entry see Field 5A.
W76-05091

QUALITY OF WELL-WATERS OF NORTHERN MADHYA PRADESH,
College of Agriculture, Parbhani (India).
For primary bibliographic entry see Field 4B.
W76-05146

PARTITIONING OF HYDROCARBONS BETWEEN THE ATMOSPHERE AND NATURAL WATERS,
Chevron Oil Field Research Co., La Habra, Calif.
For primary bibliographic entry see Field 5B.
W76-05149

WATER ELUTION OF ORGANIC MATTER IN THE NORTHERN TAIGA FORESTS OF THE KOLA PENINSULA,
K. N. Manakov.
Available from the National Technical Information Service, Springfield, Va, 22161, as N75-10519, $3.50 in paper copy, $2.25 in microfiche. NASA Technical Translation F-15,981, October 1974. 22 p, 3 fig, 6 tab, 13 ref. Translated from Pochvennye Rezhimy na Polyarnom Severe. Nauka, Leningrad, 1969.

Descriptors: *Forests, *Forest soils, *Organic matter, *Groundwater movement, Soil water movement, Organic compounds, Coniferous forests, Nutrients, Vegetation, Forest watersheds, Biology, Biological communities, Biochemistry.
Identifiers: *Northern taiga forests(USSR), *Kola Peninsula(USSR), *USSR.

The northern taiga coniferous forests of the Kola Peninsula are characterized by overall reduced productivity of the vegetative biomass compared with the typical and southern taiga. In the northern taiga, shrub and lichen-moss cover exhibiting low ash content play a major role in the ground cover. Here soil formation is characterized by the predominance of illuvial-humic podzolic (eluvial landscapes) and podzolic-boggy (superaqueous landscapes) processes. In this article, an attempt was made to present the general pattern of the migration of the primary elements in landscapes based on theoretical considerations and to compare available data on the chemical composition of soils, soil-forming rocks, vegetation, and soil-ground water. In the distinctive conditions of the northern taiga of the Kola Peninsula favorable conditions exist for the water elution of mineral elements: an adequate influx of atmospheric precipitation into the landscape, good water permeability of the soil-forming rocks, and acidic reaction of the soil solutions, promoting the dissolution of low-active compounds. A powerful factor counteracting the water elution of active elements, but even deficient supply for plants, is the intense biological absorption of substances by organisms. (Sims-ISWS)
W76-05168

COMPLEXES AFFECTING THE SOLUBILITY OF CALCIUM CARBONATE IN WATER - PHASE II,
Illinois State Water Survey, Urbana.
For primary bibliographic entry see Field 8G.
W76-05180

SALT AND NONELECTROLYTE INTERACTIONS IN WATER,
Pittsburgh Univ., Pa. Dept. of Chemistry.
Available from the National Technical Information Service, Springfield, Va. 22161, as PB-250 773, $5.00 in paper copy, $2.25 in microfiche. OWRT/S-76/13, (1976). 87 p, 6 fig, 44 tab, 88 ref.

Descriptors: Desalination, Analytical techniques, Ions, *Nuclear magnetic resonance, Volumetric analysis, Cations, Sodium, Solvents.
Identifiers: *Salt-water-organic solutions, Sodium-23, *Ligands, *Ion-ligand interactions, *Titration calorimetry, *Ion pairing.

The sodium-23 NMR chemical shift of Na tetraphenylboron was measured in a variety of solvents and ligands.The shifts and line widths were correlated with a number of electron-donor properties of the same materials to see whether Na-23 NMR was a useful probe of ion-ligand interactions. Correlations were poor for Na-23 shifts in pure ligand solvents and not much better for dilute acetone solutions of the ligand containing Na tetraphenylboron. Normalized values in acetone solution gave better correlations. Of all electron donor properties, the ability of a solvent to accept hydrogen-bonds correlates best with its interaction with Na+ as measured by the Na-23 shift. Water as a bulk solvent is a much better sodium ion solvator than water in dilute acetone solution, but there is no evidence for long-lived hydrates in solution. Cellulose acetate in acetone causes a shift of the Na-23 resonance and considerable line-broadening suggesting the presence of relatively long-lived complexes similar to the behavior of crown ethers or glyme solvents. Titration calorimetry was used to determine K, delta G, delta H and delta S for the formation of ion-pairs and also ion-ligand complexes. The ion pair data show behavior closely parallel to conductance data but with consistent differences suggesting that calorimetry measures a wider range of ion-ion interactions than conductance. Measurements for ion-ligand interactions with pure solvents, crown ethers and glymes generally support previous data with a cruder solution calorimeter.
W76-05245

PREDICTING ANION MOVEMENT IN DISTURBED AND UNDISTURBED SOILS,
North Carolina State Univ., Raleigh. Dept. of Soil Science.
For primary bibliographic entry see Field 2G.
W76-05402

CHEMICAL SORTING EFFECT AT THE BASE OF AN ALPINE GLACIER,
Brussels Univ. (Belgium). Laboratoire de Geomorphologie.
For primary bibliographic entry see Field 2C.
W76-05403

STRATIGRAPHIC AND HYDROLOGIC RELATIONSHIP OF THE PINEY POINT AQUIFER AND THE ALLOWAY CLAY MEMBER OF THE KIRKWOOD FORMATION IN NEW JERSEY,
Geological Survey, Mineola, N.Y.
For primary bibliographic entry see Field 2F.
W76-05412

CHEMICAL QUALITY AND TEMPERATURE OF WATER IN FLAMING GORGE RESERVOIR, WYOMING AND UTAH, AND THE EFFECT ON THE RESERVOIR ON THE GREEN RIVER,
Geological Survey, Salt Lake City, Utah.
For primary bibliographic entry see Field 2H.
W76-05417

WATER RESOURCES OF BASINS FOR MINOR STREAMS DRAINING INTO ST. CLAIR RIVER, LAKE ST. CLAIR, DETROIT RIVER, AND LAKE ERIE, SOUTHEASTERN MICHIGAN,
Geological Survey, Lansing, Mich.
For primary bibliographic entry see Field 7C.
W76-05427

WATER RESOURCES OF THE MISSISSIPPI AND SAUK RIVERS WATERSHED, CENTRAL MINNESOTA,
Geological Survey, St. Paul, Minn.
For primary bibliographic entry see Field 7C.
W76-05428

WATER RESOURCES OF THE HURON RIVER BASIN, SOUTHEASTERN MICHIGAN,
Geological Survey, Grayling, Mich.
For primary bibliographic entry see Field 7C.
W76-05429

DISTRIBUTION OF DIFFERENT QUALITIES OF UNDERGROUND WATERS IN REWARI TEHSIL OF HARYANA STATE,
Haryana Agricultural Univ., Hissar (India).
For primary bibliographic entry see Field 3C.
W76-05432

2L. Estuaries

ROOKERY BAY LAND USE STUDIES, ENVIRONMENTAL PLANNING STRATEGIES FOR THE DEVELOPMENT OF A MANGROVE SHORELINE, STUDY NO. 3, ESTUARINE WATER QUALITY,
Conservation Foundation, Washington, D. C.
For primary bibliographic entry see Field 5G.
W76-05005

ROOKERY BAY LAND USE STUDIES, ENVIRONMENTAL PLANNING STRATEGIES FOR THE DEVELOPMENT OF A MANGROVE SHORELINE, STUDY NO. 5, ESTUARINE BIOLOGY,
Conservation Foundation, Washington, D. C.
For primary bibliographic entry see Field 5G.
W76-05006

ROOKERY BAY LAND USE STUDIES, ENVIRONMENTAL PLANNING STRATEGIES FOR THE DEVELOPMENT OF A MANGROVE SHORELINE, STUDY NO. 7, POLICY AND REGULATORY DIMENSIONS,
Conservation Foundation, Washington, D. C.
For primary bibliographic entry see Field 5G.
W76-05007

ROOKERY BAY LAND USE STUDIES, ENVIRONMENTAL PLANNING STRATEGIES FOR THE DEVELOPMENT OF A MANGROVE SHORELINE, STUDY NO. 9, PRINCIPLES OF ECOSYSTEM MANAGEMENT,
Conservation Foundation, Washington, D.C.
For primary bibliographic entry see Field 5G.
W76-05008

ROOKERY BAY LAND USE STUDIES, ENVIRONMENTAL PLANNING STRATEGIES FOR THE DEVELOPMENT OF A MANGROVE SHORELINE, STUDY NO. 10, GROWTH AND LAND USE, STUDY NO. 11, ECONOMIC IMPLICATIONS OF LAND DEVELOPMENT ALTERNATIVES, STUDY NO. 12, A SIMULATION MODELING APPROACH TO THE STUDY OF DEVELOPMENT ALTERNATIVES,
For primary bibliographic entry see Field 5G.
W76-05009

NUMERICAL SIMULATION OF SALT-WATER INTRUSION IN COASTAL AQUIFERS, PART 1,
Princeton Univ., N. J. Dept. of Geological and Geophysical Sciences.
For primary bibliographic entry see Field 5B.
W76-05010

NUMERICAL SIMULATION OF SALT-WATER INTRUSION IN COASTAL AQUIFERS, PART 2,
Princeton Univ., N. J. Dept of Geophysical Sciences.
For primary bibliographic entry see Field 5B.
W76-05011

WATER POWER MACHINE AND UNDERSEA, UNDER WATER GENERATOR STATION,
For primary bibliographic entry see Field 8C.
W76-05039

SEASONAL OCCURRENCE AND DISTRIBUTION OF MICROBIAL INDICATORS AND PATHOGENS IN THE RHODE RIVER OF CHESAPEAKE BAY,
Maryland Univ., College Park. Dept. of Microbiology.
For primary bibliographic entry see Field 5B.
W76-05052

PRETREATMENT AND ULTIMATE DISPOSAL OF WASTEWATER SOLIDS,
Environmental Protection Agency, New York. Region II.
For primary bibliographic entry see Field 5D.
W76-05079

EXPANSION OF SALT-WATER ZONE DUE TO WELL DISCHARGE,
North Carolina State Univ., Raleigh. Dept. of Civil Engineering.
A-A. I. Kashef, and J. C. Smith.
Water Resources Bulletin, Vol. 11, No. 6, p 1107-1120, December 1975. 7 fig, 2 tab, 10 ref. OWRT C-4061(No. 9013) (4)

Descriptors: *Saline water-freshwater interfaces, *Water wells, *Saline water intrusion, Coasts, Aquifers, Pumping, Aquifer characteristics, Computer models, Water management(Applied), Groundwater movement, Hydraulic conductivity, Specific weight, Potentiometric level, Equations, Natural flow, Theis equation, Storage coefficient, Groundwater, Saline water, Wells.
Identifiers: *Upconing, Dimensionless solutions, Well location, Pump capacity.

In coastal confined aquifers, the extent of salt-water wedge due to natural groundwater flow can be determined by available methods. If water is pumped by a discharge well, the quality of the water depends upon the rate and duration of pumping as well as the location of the well. A study was made to find the extent of the progress of salt-water intrusion due to the operation of one discharge well, taking into account various conditions of aquifer properties, pump capacities, natural flow, time effects, and well locations. Dimensionless solutions for specific conditions were obtained by means of a simple computer program. Range of most common conditions was discussed. One of the main findings of the study was that salt water may be pumped out of a well even if it is located in an initially totally fresh-water zone beyond the natural salt/fresh-water interface. (Visocky-ISWS)
W76-05133

BACKGROUND PAPERS FOR A WORKSHOP ON INPUTS, FATES, AND EFFECTS OF PETROLEUM IN THE MARINE ENVIRONMENT, VOLUME I.
National Research Council, Washington, D.C. Ocean Affairs Board.
For primary bibliographic entry see Field 5B.
W76-05135

PETROLEUM INPUTS TO THE MARINE ENVIRONMENT FROM LAND SOURCES,
Engineering-Science, Inc., Berkeley, Calif
For primary bibliographic entry see Field 5B.
W76-05140

ESTIMATES OF ANNUAL INPUT OF PETROLEUM TO THE MARINE ENVIRONMENT FROM OFFSHORE PRODUCTION OPERATIONS,
Exxon Production Research Co., Houston, Tex. Geologic Research.
For primary bibliographic entry see Field 5B.
W76-05142

BEACH CUSPS FORMED BY INTERSECTING WAVES,
Delaware Univ., Newark. Dept. of Civil Engineering.
R. A. Dalrymple, and G. A. Lanan.
Geological Society of America Bulletin, Vol. 87, No. 1, p 57-60, January 1976. 2 fig, 2 tab, 25 ref. ONR N00014-69-A-407.

Descriptors: *Beaches, *Waves(Water), *Currents(Water), Geology, Geomorphology, Marine geology, Rip currents, Erosion, Wave pile-up, Laboratory tests, Water circulation, Hydraulics.
Identifiers: *Beach cusps, *Intersecting waves, Cusp formation, Wave patterns.

From the time when theories were first postulated on beach cusps, intersecting wave trains have been mentioned as one possible mechanism for cusp formation. However, this mechanism has been largely ignored, and no real effort has been made to understand it since Branner's work in 1900. It can be experimentally shown that rip currents, generated by intersecting waves of the same length, can create beach cusps of a known periodicity that depends on the wave length and the angle between the intersecting wave trains. (Lee - ISWS)
W76-05163

NEWFOUNDLAND'S CASE ON OFFSHORE MINERALS: A BRIEF OUTLINE,
Newfoundland Ministry of Mines and Energy, St. John's.
For primary bibliographic entry see Field 6E.
W76-05196

COASTAL ZONE MANAGEMENT: THE PROCESS OF PROGRAM DEVELOPMENT,
Coastal Zone Management Inst., Sandwich, Mass.
For primary bibliographic entry see Field 6B.
W76-05204

EXTENSION OF THE MARINE PROTECTION, RESEARCH AND SANCTUARIES ACT OF 1972.
For primary bibliographic entry see Field 5G.
W76-05209

DISTRIBUTION OF NUTRIENTS IN LOUISIANA'S COASTAL WATERS INFLUENCED BY THE MISSISSIPPI RIVER,
Louisiana Wildlife and Fisheries Commission, New Orleans. Div. of Oysters, Water Bottoms and Seafoods.
For primary bibliographic entry see Field 5B.
W76-05259

THE TRI-STATE COASTAL ZONE MANAGEMENT PERSPECTIVES.
Tri-State Regional Planning Commission, New York.
For primary bibliographic entry see Field 6G.
W76-05260

WESTERNPORT BAY ENVIRONMENTAL STUDY 1973-1974.
Victoria Ministry for Conservation, Melbourne (Australia). Westernport Bay Environmental Study.
For primary bibliographic entry see Field 6G.
W76-05404

A METHOD FOR APPLYING RESEARCH TO ENVIRONMENTAL PLANNING AND MANAGEMENT: A CASE STUDY OF ISSUES IMPORTANT TO THE CHESAPEAKE BAY REGION,
Center for the Environment and Man, Inc., Hartford, Conn.
For primary bibliographic entry see Field 6B.
W76-05434

EXPERIMENTAL TRANSPLANTATION OF THE CLAM MERETRIX CASTA (CHEMNITZ) IN THE MARINE FISH FARM,
Udaipur Univ. (India). Dept. of Zoology.
V. S. Durve.
Indian J Fish. Vol 20 No. 1: p 56-60 1973 Illus.

Descriptors: *Clams, Estuaries, Fish farming. Identifiers: Meretrix Casta, Transplantation Athankarai estuary(India).

Several hundred clams M. casta (Chemnitz) obtained from Athankarai estuary on Oct. 28, 1964, were transplanted in the pond of the fish farm of the Central Marine Fisheries Research Institute, Mandapam Campl (India). During the period of study extending over 6 mo. there was an initial high rate of growth in the seed clams immediately on transplantation. However, this rate of growth declined, first slowly and then rapidly, after 5 mo. Probable causes for this uneven growth are discussed.--Copyright 1975, Biological Abstracts, Inc.
W76-05447

EFFECT OF SALINITY ON THE SURVIVAL AND REPRODUCTIVITY OF OLIGOCHAETES OF THE FAMILY TUBIFICIDAE OF THE DNIEPER-BUG ESTUARY, (IN RUSSIAN),
For primary bibliographic entry see Field 5C.
W76-05454

3. WATER SUPPLY AUGMENTATION AND CONSERVATION

3A. Saline Water Conversion

REVERSE OSMOSIS MEMBRANE,
Department of the Interior, Washington, D.C. Office of the Secretary.
J. E. Cadotte.
U.S. Patent No. 3,926,798, 4 p, 4 tab, 2 ref; Official Gazette of the United States Patent Office, Vol 941, No 3, p 1331, December 16, 1975.

Descriptors: *Patents, *Water purification, Water quality control, *Desalination, *Reverse osmosis, *Membranes, Membrane processes, Separation techniques, Desalination apparatus, Thin films, *Waste water treatment.

Reverse osmosis membranes having excellent flux and salt rejection properties, as well as freedom from compaction or degradation, may be prepared by coating a microporous support with an aqueous solution of furfuryl alcohol and an acid catalyst, followed by heating to polymerize the furfuryl alcohol. This results in formation of a highly selective barrier on the surface of the support. The porous support may be any of the types conventionally used in reverse osmosis processes. Sulfuric acid has been found to be particularly effective as the acid catalyst. However, any acid catalyst capable of polymerizing the furfuryl alcohol may be used. It has been found that the acid catalyst, in addition to catalyzing the polymerization reaction, is to some degree incorporated into the product, thereby providing acidic groups in the membrane. These acidic groups are believed to provide hydrophylic sites in the membranes, thereby enhancing their performance in reverse osmosis processes. An additional consequence of the presence of the presence of the acidic groups in the membrane is that performance of the membrane is effected by the type of salts in the feed water. Feed solutions containing only monovalent cations will tend to swell the membrane and produce higher flux, while those containing polyvalent cations will inhibit swelling, thereby lowering the flux but producing maximum salt rejection. (Sinha-OEIS)
W76-05029

DEVICE FOR MEMBRANE FILTRATION,
Industriele Onderneming Wavin, N.V., Zwolle (Netherlands).
For primary bibliographic entry see Field 5F.
W76-05037

DESIGN AND SPECIFICATION BID PACKAGE, 10,000 GPD EUTECTIC FREEZE PILOT PLANT.
Fluor Engineers and Constructors, Inc., Los Angeles, Calif.
Available from the National Technical Information Service, Springfield Va 22161, as PB-250 455, $6.00 in paper copy, $2.25 in microfiche. OWRT/S--76/18, March 1975. 121 p, 12 fig, 64 specification sheets. OWRT 14-30-3277.

Descriptors: *Desalination plants, *Cystallization, Slurries, Refrigeration, *Freezing, *Specifications, *Design criteria, *Pilot plants, *Design standards, Evaporation.
Identifiers: *Eutectic freezing, Hydrocyclones, Direct contact evaporation, Refrigerant R-114.

Technical Specifications for a 10,000 GPD Eutectic Freeze Pilot Plant are presented. Engineering design criteria, process requirements, mechanical designs, fabrication and erection, and quality of workmanship for the pilot plant are established. Compliance with the above may include, but not be limited to, routing, sizing, material selection for piping and instrument control schemes for plant operation. Required arrangement of the pilot plant and instrumentation and controls needed to operate the system are shown on incorporated drawings as is the process flow diagram.
W76-05178

THE COLORADO RIVER SALINITY PROBLEM WITH MEXICO,
For primary bibliographic entry see Field 5G.
W76-05194

THERMODYNAMIC OF SALT SOLUTIONS AND GEOTHERMAL BRINES AT ELEVATED TEMPERATURES.
Westinghouse Research Labs., Pittsburgh, Pa.
C. T. Liu.
Available from the National Technical Inormation Service Springfield,Va 22161, as PB-250733, $5.00 in paper copy, $2.25 in microfiche. OWRT/S-76/19 71 p 17 fig, 7 tab, 21 ref, 2 append. 14-302918.

Descriptors: *Thermodynamics, *Saline water, *Geothermal studies, Brines, *Vapor pressure, Boilng, *Desalination.
Identifiers: *Osmotic Coefficients, *Boiling point elevation, *Vapor pressure cells, Water Activity.

Vapor pressure lowering measurements of synthetic geothermal brines have been carried out at temperatures from 75 to 250C with three concentrations ranging from one-to four-fold concentrates of hot-water type geothermal chemical systems. Osmotic coefficients and boiling point elevations of the brine solutions have been obtained; these are compared with the better known data for sodium chloride and the less extensive data for saline water concentrates. The results are discussed in terms of the structural aspect of ion-solvent interaction and ion association. As temperature increases, the individual ionic character of both synthetic geothermal salt and simulated sea salt brines starts to diminish; these results can be explained by ion association which becomes more favorable for divalent ions at higher temperatures. The mixture osmotic coefficient is a function of several variables in a four-ion system. Three examples are cited to illustrate such a geometrical model. The composition axes are measures of the relative contributions of the cationic and anionic constituents to ionic strength. Knowledge of the osmotic coefficient surface for this system is incomplete.
W76-05244

SALT AND NONELECTROLYTE INTERACTIONS IN WATER,
Pittsburgh Univ., Pa. Dept. of Chemistry.
For primary bibliographic entry see Field 2K.
W76-05245

WATER PURIFICATION TECHNOLOGIES, (IN JAPANESE),
For primary bibliographic entry see Field 5D.
W76-05291

WASTE-TREATMENT APPLICATIONS OF REVERSE OSMOSIS,
General Atomic Co., San Diego, Calif. Roga Systems Div.
For primary bibliographic entry see Field 5D.
W76-05294

MEETING EPA STANDARDS WITH REVERSE OSMOSIS,
Universal Oil Products Co., Del Mar, Calif. Roga Div.
For primary bibliographic entry see Field 5D.
W76-05295

REVERSE OSMOSIS IN INDUSTRIAL WATER TREATMENT,
Permutit Co., London (England).
For primary bibliographic entry see Field 5D.
W76-05296

SALINE WATER CONVERSION ENGINEERING DATA BOOK - 1975.
Kellogg (M. W.) Co., Piscataway, N. J.
Available from the National Technical Information Service, Springfield, Va 22161, as PB-250 907 $18.75 in paper copy, $2.25 in microfiche. OWRT/s -- 1976, (Special 07 updated), October 1975, 730 p. 14-30-3121.

Descriptors: *Saline water, *Desalination processes, Waste water treatment, *Data collections, Demineralization, Membrane processes, Dialysis, Electrodialysis, Osmosis, Reverse osmosis, Distillation, Freezing, Seawater, Towers, Dearation, Desalination apparatus, Equipment, Chemistry, Thermal conductivity, Thermodynamic behavior, Physical properties, Equilibrium, Hydrate processes, *Design standards, Economic efficiency.
Identifiers: Liquid-liquid spray towers, Seawater dearators, Conversion tables, *Engineering data, *Data books, Flow diagrams.

Information is presented on physical properties of chemicals and selected materials, derived thermodynamic data, phase equilibria, equipment cost and economic factors, design methods and standards for saline water conversion. Sample calulations on pressure drop in two phase flow, process flow diagrams for distillation, freezing, reverse osmosis and electrodialysis are included. Design of seawater deaerators, liquid-liquid spray towers and, seawater chemistry are discussed.
W76-05347

GUIDE TO THE COSTING OF WATER FROM NUCLEAR DESALINATION PLANTS,
Applied Research and Engineering Ltd., Durham (England).
R. Starmer, and F. Lowes.
International Atomic Energy Agency, Vienna, Technical Reports Series No. 151, 1973. 87 p 44 fig, 13 tab, 6 ref, 2 append.

Descriptors: *Steam, *Water costs, *Nuclear reactors, *Desalination plants, *Cost analysis, Estimated costs, Equipment, Flash distillation, Electric power production, Electric power costs, Computer programs, Capital costs, Turbines, Boilers, Design, Fossil fuels, Evaporators, Electric powerplants.
Identifiers: Dual-purpose plants.

Methods enabling realistic water costs to be determined for water produced from nuclear-powered dual-purpose systems are presented, using up-to-date cost data. The British Nuclear Design and Construction Ltd. supplied current steam costs from nuclear heat sources. To assess price validity of desalination plant equipment, escalation of U.K. commodities and labor costs were given. Costs are given so that future cost escalations could be estimated. Costs are presented in a series of cost breakdowns and performance curves. Cost estimates of electric power generated and low pressure steam exhausted to the distillation plant heat input section can be made. A computer program was used to estimate water cost for various conditions and cases and the minimum water cost for selected capital charge rates. Turbine performance figures are plotted so that for a given initial steam condition, power produced by steam expanding in the turbine to a specified back pressure can be determined. From data in the curves presented, water costs, electricity costs, and power produced can be determined for any selected water requirement and heat source (nuclear or fossil). Multistage flash distillation plants are evaluated to determine water costs. Examples are given and suggestions made for obtaining accurate estimates in special situations. (Buchanan-Davidson--Wisconsin)
W76-05436

3B. Water Yield Improvement

AN INTERNATIONAL CENTRE FOR MANATEE RESEARCH.
National Academy of Sciences, Washington, D.C.
For primary bibliographic entry see Field 4A.
W76-05433

CONTROL OF AQUATIC VEGETATION IN NEW YORK STATE,
New York State Coll. of Agriculture and Life Sciences.
For primary bibliographic entry see Field 5C.
W76-05467

MECHANICAL MANAGEMENT OF AQUATIC VEGETATION: ANALYTICAL STUDIES OF UNIT OPERATIONS POTENTIALLY USEFUL IN THEIR PROCESSING,
Wisconsin Univ., Madison. Dept. of Mechanical Engineering.
S. E. Sy.
PhD thesis, 1974. 239 p. 34 fig., 25 tab., 44 ref., 5 append.

Descriptors: *Aquatic weed control, *Mechanical control, *Dewatering, *Separation techniques, Wisconsin, Pressure, Moisture content, Forages, Chemical analysis, Mathematical models, Proteins, Calcium, Fibers(Plants), Feeds, Poultry, Fertilizers, Mulching.
Identifiers: *Eurasian watermilfoil, *Dane County(Wis.), *Solid-Liquid separation processes, Screw press, Xanthophyll.

Mechanical dewatering and solid-liquid separation methods for reducing harvested Eurasian watermilfoil weight and volume and economical use of the harvested material were investigated. 'Initiation pressure,' indicating material condition relative to dewatering ease, permitted prediction of moisture content. With dead-weight, constant-pressure dewatering operations, a short efficient period was followed by a slower falling-rate period; a derived second-order rate mechanism describes the falling-rate period. The solids:liquid ratio was constant, so juice solids can be expressed as a fraction of original solids can be expressed as a fraction of original solid, as verified by a laboratory screw press. Correlation between juice solids and chemical constituents indicated need for efficient solid-liquid separation. Weight-volume reductions were achieved by concentrating solids by solid-liquid separation and discarding low-solid supernatants. Eurasian watermilfoil and terrestrial forage plant chemical compositions were comparable and related to plant maturity. Because of high crude protein, calcium, and

xanthophyll and low crude fiber contents, watermilfoil can be used in low-fiber rations, poultry feed supplements, fertilizers, or mulches. Recommendations suggest that the laboratory screw press and continuous solid-liquid separation equipment be tested further, that animal feeding trials be conducted, and indoor growth tanks used to study frequency and depth of harvesting and seasonal effects on aquatic vegetation growth. (Buchanan-Davidson-Wisconsin).
W76-05469

3C. Use Of Water Of Impaired Quality

QUALITY OF WELL-WATERS OF NORTHERN MADHYA PRADESH,
College of Agriculture, Parbhani (India).
For primary bibliographic entry see Field 4B.
W76-05146

COMMON LAW REMEDIES FOR SALT POLLUTION,
For primary bibliographic entry see Field 6E.
W76-05191

COLORADO RIVER SALINITY PROBLEM: HAS A SOLUTION BEEN FOUND,
Denver Univ., Colo. Coll. of Law
For primary bibliographic entry see Field 6E.
W76-05200

AGRONIMIC EFFECTS OF THE LAND DISPOSAL OF WASTES FROM THE AGRICULTURAL AND FOOD INDUSTRIES (REPERCUSSIONS AGRONOMIQUES DES EPANDAGES D'EFFLUENTS DES INDUSTRIES AGRICOLES ET ALTIMENTAIRES,
Institut National de la Recherche A Agronomique, Versailles (France). Station Centrale d'Agronomie.
For primary bibliographic entry see Field 5D.
W76-05331

DISTRIBUTION OF DIFFERENT QUALITIES OF UNDERGROUND WATERS IN REWARI TEHSIL OF HARYANA STATE,
Haryana Agricultural Univ., Hissar (India).
H. R. Manchanda, M. L. Manchanda, and R. S. Siyag.
Indian J Agric Sci. 42(9): 835-839, 1972.

Descriptors: *Water wells, *Water quality, Groundwater, Irrigation, *Salinity, Soil treatment, Saline water, Salt tolerance, Distribution, Soil texture.
Identifiers: *India(Haryana), Tube-well waters.

From 142 villages of Rewari tehsil of Haryana, 575 well-waters or tube-well-waters were collected. Areas having normal, saline, sodic and saline-cum-sodic water pockets were delineated. In Bawal, Rewari, Pataudi and Khol blocks, 13, 22, 22 and 44% of the underground waters, respectively, were safe for irrigation; but 12-26% of the waters in the area were highly saline-cum-sodic, with high B content, and were unsafe for irrigation. Subsoil waters of Pataudi and Bawal blocks (48 and 75%) were predominantly sodic with low salt content, which could be profitably exploited by treatment with gypsum. In this tehsil, 15-32% waters were highly saline, and could be occasionally used on light textured soils for salt tolerant crops.--Copyright 1974, Biological Abstracts, Inc.
W76-05432

3D. Conservation In Domestic and Municipal Use

THE ECONOMIC VALUE OF WATER FOR SELECTED USES IN SOUTHWESTERN NORTH DAKOTA,
North Dakota Water Resources Research Inst., Fargo.
For primary bibliographic entry see Field 6B.
W76-05350

DEVELOPMENT PRIORITIES IN THE WEST RIVER REGION, NORTH DAKOTA,
North Dakota Water Resources Research Inst., Fargo.
For primary bibliographic entry see Field 6B.
W76-05352

HOUSEHOLD WATER USE,
American Society of Civil Engineers, New York.
For primary bibliographic entry see Field 6D.
W76-05353

THE SEWERLESS SOCIETY,
For primary bibliographic entry see Field 5D.
W76-05439

ECONOMICS OF URBAN WATER DEMAND: A CASE STUDY OF THE HONOLULU BOARD OF WATER SUPPLY,
Hawaii Univ., Honolulu. Dept. of Agricultural and Resource Economics.
For primary bibliographic entry see Field 6D.
W76-05455

3E. Conservation In Industry

RAIN DANCE DOESN'T WORK HERE ANYMORE, OR WATER USE AND CITIZEN ATTITUDES TOWARDS WATER USE IN ALBUQUERQUE, NEW MEXICO,
New Mexico Univ., Albuquerque. Div. of Governmental Research.
For primary bibliographic entry see Field 6B.
W76-05016

ELECTROCHEMICAL CONTAMINANT REMOVAL FROM AQUEOUS MEDIA,
Andco Inc., Buffalo, N.Y. (assignee)
For primary bibliographic entry see Field 5D.
W76-05024

PROCESS FOR RECOVERING TIN SALTS FROM THE WASTE RINSE WATER OF A HALOGEN TIN PLATING PROCESS,
Pitt Metals and Chemicals, Inc., Pittsburgh, Pa. (assignee)
For primary bibliographic entry see Field 5D.
W76-05025

BIOLOGICAL TREATMENT OF PLANT WASTE STREAMS TO REMOVE CYANURIC ACID,
FMC Corporation, Philadelphia, Pa. (Assignee).
For primary bibliographic entry see Field 5D.
W76-05027

PREPARATION OF ACTIVATED SLUDGE AND TREATMENT OF WASTE WATER THEREWITH,
Nippon Gohsei Kagaku Kogyo Kabushiki Kaisha, Osaka (Japan). (Assignee).
For primary bibliographic entry see Field 5D.
W76-05028

DEVICE FOR THE CONTINUOUS TREATMENT OF LIQUID STREAMS,
Gesellschaft zur Wiederaufarbeitung von Kernbrennstoffen m.b.H., Leopoldshafen bei Karlsruhe (West Germany).
For primary bibliographic entry see Field 5D.
W76-05033

WATER POWER MACHINE AND UNDERSEA, UNDER WATER GENERATOR STATION,
For primary bibliographic entry see Field 8C.
W76-05039

REFINERY DESIGN (CIRCA 1984),
Fluor Engineers and Constructors, Inc., Los Angeles, Calif.
For primary bibliographic entry see Field 5D.
W76-05104

EFFLUENT CONTROL AND WATER CONSERVATION AT BOWATER-SCOTT MILL, NORTHFLEET.
For primary bibliographic entry see Field 5D.
W76-05106

POLLUTION CONTROL IN THE SWEDISH PULP AND PAPER INDUSTRY,
Swedish Pollution Control Co., Stockholm.
For primary bibliographic entry see Field 5D.
W76-05108

RECYCLING OF COOLING WATER IN CABLE MANUFACTURE,
Western Electric Co., Buffalo, N.Y.
For primary bibliographic entry see Field 5D.
W76-05120

WATER AS A FACTOR IN ENERGY RESOURCES DEVELOPMENT,
Utah Center for Water Resources Research, Logan.
For primary bibliographic entry see Field 6B.
W76-05250

INDUSTRIAL OILS, RECOVERY OR DISPOSAL. (LES HUILLES INDUSTRIELLES, RECUPERATION OU ELIMINATION.),
For primary bibliographic entry see Field 5D.
W76-05280

EFFLUENT CONTROL IN ZINC BONDERIZING PROCESSES: I. THE RECYCLE OF RINSE WATERS VIA AN ION EXCHANGE PROCESS,
Puricons, Inc., Berwyn, Pa.
For primary bibliographic entry see Field 5D.
W76-05284

PROBLEMS OF GALVANIC WASTEWATER PURIFICATION IN CLOSED WATER CYCLE (PROBLEMY OCZYSZCANIA SCIEKOW GALWANIZERSKICH W ZAMKNIETYM OBIEGU WODNYM),
For primary bibliographic entry see Field 5D.
W76-05285

DECOLORIZE KRAFT BLEACH PLANT EFFLUENTS EFFECTIVELY WITH LOW-COST POLYMERIC ADSORPTION METHOD,
Rohm and Haas Co., Philadelphia, Pa.
For primary bibliographic entry see Field 5D.
W76-05288

ADSORPTION TREATMENT OF KRAFT PULP LIGNIN WASTE WITH SYNTHETIC, POLYMERIC ADSORBENTS, (IN JAPANESE),
National Research Inst. for Pollution and Research, Tokyo (Japan).
For primary bibliographic entry see Field 5D.

W76-05289

CLOSED SYSTEM FOR WASTE WATER IN METAL SURFACE PROCESSING FACTORY, (IN JAPANESE),
For primary bibliographic entry see Field 5D.
W76-05290

WATER QUALITY AND THE TEXTILE INDUSTRY,
Cosgrove (W. J.) and Associates, Inc., Montreal (Quebec).
For primary bibliographic entry see Field 5D.
W76-05292

WOOL SCOUR WASTE TREATMENT.
For primary bibliographic entry see Field 5D.
W76-05293

REVERSE OSMOSIS IN INDUSTRIAL WATER TREATMENT,
Permutit Co., London (England).
For primary bibliographic entry see Field 5D.
W76-05296

WASTEWATER TREATMENT SYSTEM IN STEEL MILLS, (IN JAPANESE),
For primary bibliographic entry see Field 5D.
W76-05311

PURIFIER ESP. FOR ELECTRO PLATING EFFLUENT WATER.
For primary bibliographic entry see Field 5D.
W76-05313

MUNICIPAL WASTEWATER RECLAMATION--AN INDUSTRIAL WATER SUPPLY,
Dallas Reclamation Research Center, Tex.
For primary bibliographic entry see Field 5D.
W76-05318

OZONIZATION AS A MEANS OF WASTE WATER PURIFICATION,
For primary bibliographic entry see Field 5D.
W76-05339

THE ECONOMIC VALUE OF WATER FOR SELECTED USES IN SOUTHWESTERN NORTH DAKOTA,
North Dakota Water Resources Research Inst., Fargo.
For primary bibliographic entry see Field 6B.
W76-05350

DEVELOPMENT PRIORITIES IN THE WEST RIVER REGION, NORTH DAKOTA,
North Dakota Water Resources Research Inst., Fargo.
For primary bibliographic entry see Field 6B.
W76-05352

GUIDE TO THE COSTING OF WATER FROM NUCLEAR DESALINATION PLANTS,
Applied Research and Engineering Ltd., Durham (England).
For primary bibliographic entry see Field 3A.
W76-05436

WATER TREATMENT--TECHNIQUE FOR ENERGY CONSERVATION,
Betz Entec, Inc., Trevose, Pa.
For primary bibliographic entry see Field 5F.
W76-05438

IDENTIFICATION OF GAMMA-VALEROLACTONE IN WASTE WATER FROM AN OIL-SHALE IN SITU RETORT,
Bureau of Mines, Laramie, Wyo. Laramie Energy Research Center.
For primary bibliographic entry see Field 5A.
W76-05448

WATER USE IN SELECTED COMMERCIAL AND INSTITUTIONAL ESTABLISHMENTS IN THE BALTIMORE METROPOLITAN AREA,
American Society of Civil Engineers, New York.
For primary bibliographic entry see Field 6D.
W76-05452

REUTILIZATION EXPERIMENTS ON WASTE WATER FROM PAPER AND PULP MILLS (KAMI PARUPU KOJO HISUI NO SAISEI RYO JIKKEN),
For primary bibliographic entry see Field 5D.
W76-05482

THE STATUS OF WATER POLLUTION CONTROL IN THE SOVIET UNION, (FIRST PART),
Crown Zellerbach Corp., Camas, Wash. Environmental Services Div.
For primary bibliographic entry see Field 5D.
W76-05483

THE STATUS OF WATER POLLUTION CONTROL IN THE SOVIET UNION, (SECOND PART),
Crown Zellerbach Corp., Camas, Wash. Environmental Services.
For primary bibliographic entry see Field 5D.
W76-05484

SYSTEM ANALYSIS OF REFINER MILL OPERATION,
Idaho Univ., Moscow. Dept. of Chemical Engineering.
For primary bibliographic entry see Field 5D.
W76-05487

BIG SAVINGS WITH REVERSE OSMOSIS AND ACID COPPER,
For primary bibliographic entry see Field 5D.
W76-05493

NEW MEMBRANES FOR TREATMENT OF METAL FINISHING EFFLUENTS BY REVERSE OSMOSIS.
For primary bibliographic entry see Field 5D.
W76-05495

LOOP CLOSED ON CADMIUM.
For primary bibliographic entry see Field 5D.
W76-05497

EFFICIENT, NONPOLLUTING ETHYLBENZENE PROCESS,
Mobil Research and Development Corp., Paulsboro, N. J.
For primary bibliographic entry see Field 5D.
W76-05498

SOLVENT RECOVERY FROM POLYMER PRODN. WASTES.
For primary bibliographic entry see Field 5D.
W76-05499

3F. Conservation In Agriculture

BIBLIOGRAPHY OF WATER RESOURCES OF THE HAWAIIAN ISLANDS,
Hawaii Univ., Honolulu. Water Resources Research Center.
For primary bibliographic entry see Field 10C.
W76-05013

A CONTINUOUS REVIEW INVENTORY MODEL FOR IRRIGATION WATER APPLICATION,
Arizona Univ., Tucson. Dept. of Systems and Industrial Engineering.
M. A. Cali.
Available from the National Technical Information Service, Springfield, Va. 22161, as PB-250 118, $5.00 in paper copy, $2.25 in microfiche. Master of Science Thesis, 1975, 85 p, 3 fig, 2 tab, 36 ref, 3 append. OWRT B-032-ARIZ(10).

Descriptors: *Irrigation systems, *Irrigation efficiency, *Water management(Applied), *Soil-water-plant relationships, *Costs, Irrigation operation and maintenance, Irrigation practices, Irrigation programs, Management, Water delivery, Water requirements, Agriculture, Irrigation, Irrigation water, Water distribution(Applied), Rates of application, Timing, Crop response, Rainfall, Evapotranspiration, Soil moisture.

Efficient management of farm irrigation systems involves the proper choice of method, timing, and quantity of irrigation water application. Through the use of a continuous review model of the irrigation system, an optimal irrigation policy may be obtained and effected. Implementation of the model requires knowledge of the crop susceptibility to moisture stress, the crop's expected demand for water, and the expected precipitation. Using this knowledge, an optimal amount of irrigation and an optimal reorder point may be determined and with continuous monitoring of the level of available soil moisture, the farmer irrigates the optimal amount when the reorder point is reached. A review is given of several existing methods for maximizing crop yield or profit by determining an optimal irrigation policy. An analogy is drawn between the farmer's problem of determining an optimal irrigation policy and the businessman's problem of determining an optimal ordering policy. (Robinett-Arizona)
W76-05019

METHOD FOR IRRIGATING TERRAIN,
W. C. Reeder, and N. D. Batterson.
U.S. Patent No. 3,926,374, 5 p, 14 fig, 3 ref; Official Gazette of the United States Patent Office, Vol 941, No 3, p 1204, December 16, 1975.

Descriptors: *Patents, *Irrigation, *Irrigation systems, Sprinkler irrigation, Water distribution(Applied), Irrigation efficiency, Irrigation effects, Flow control, Application equipment, Temperature control, Frost protection.
Identifiers: *Drip irrigation, *Weeper irrigation.

A weeper type irrigation system is disclosed which has a variety of modes of use including widely varying flow rates and different modes of discharging water not only for irrigation purposes but to control humidity and temperature conditions. Both the water distributing manifold and the weeper device are formed from semi-rigid or rigid plastic material. The weeper device comprises an inlet tube having self-sealing self-retaining fit with a mounting hole punched through the side of the plastic distributing manifold. A ball type of valve is held captive within the tubular housing and is responsive to gravity to seat against a valve seat near its inlet end and responsive to flowing pressurized water to seat against an outer weeper valve seat. At least one and preferably a number of minute flow passages are formed in the latter seat and converge toward the outlet opening in a manner effective to create a misty spray of the small flow permitted so long as the water pressure holds the valve seated across the weeper or outer seat. If not obstructed, the resulting misty spray may extend to a height of several feet before falling to the ground in a widely dispersed manner. A protective guard cap having a snap fit over the

outlet end is effective when in one installed position to invert this spray discharge to a flow occurring along the exterior side of the weeper and thence into the ground. If the cap is pressed to a second position, it holds the valve off the valve seat and allows a substantially greater flow for increased irrigation. (Sinha - OEIS)
W76-05021

WEEPER IRRIGATION DEVICE,
W. C. Reeder, and N. D. Batterson.
U.S. Patent No. 3,926,375, 4 p, 4 fig, 3 ref; Official Gazette of the United States Patent Office, Vol 941, No 3, p 1204, December 16, 1975.

Descriptors: *Patents, *Irrigation, *Irrigation systems, *Water distribution(Applied), *Irrigation efficiency, Irrigation effects, Flow control, Valves, Application equipment.
Identifiers: *Weeper irrigation, *Drip irrigation.

A weeper irrigation device is improved by utilizing an additional flow responsive valve member in the valve chamber. This second valve member remains in the close vicinity of the inlet valve seat whereas the other valve member responds to the pressure build-up in the valve chamber on initiation of water flow and moves into seating engagement with the weeper outlet valve seat. Any tendency of the inlet valve to spin or gyrate is confined to this valve member with the result that the other valve member responds quickly to pressure buildup to seat against the weeper outlet and remains firmly seated there until the water supply is cut off. During the brief interval the weeper flow control valve is rising to its operating position a flushing flow of water takes place and this flow is highly effective in removing any sediment which may have collected along the outlet passage. The weeper also includes a short tubular outlet passage over which either a short or a long extension hose can be readily telescoped with a snug fit. A short tube permits the weeper device to be buried slightly below the ground surface with only the discharge end of the tube exposed. (Sinha-OEIS)
W76-05022

GREAT PLAINS EVAPOTRANSPIRATION BY A RESISTANCE MODEL USING REMOTELY SENSED THERMAL IMAGERY,
Nebraska Univ. Lincoln. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 2D.
W76-05179

EXPERIMENTAL DETERMINATION OF SOIL MOISTURE ON IRRIGATED LANDS FROM RADIOACTIVE SOIL EMISSION,
For primary bibliographic entry see Field 2G.
W76-05401

4. WATER QUANTITY MANAGEMENT AND CONTROL

4A. Control Of Water On The Surface

BIBLIOGRAPHY OF WATER RESOURCES OF THE HAWAIIAN ISLANDS,
Hawaii Univ., Honolulu. Water Resources Research Center.
For primary bibliographic entry see Field 10C.
W76-05013

A CONTINUOUS REVIEW INVENTORY MODEL FOR IRRIGATION WATER APPLICATION,
Arizona Univ., Tucson. Dept. of Systems and Industrial Engineering.
For primary bibliographic entry see Field 3F.
W76-05019

AN ENGINEERING EMERGENCY: THE 1974 FLOODS,
Brisbane City Council (Australia). Dept. of Water Supply and Sewerage.
G. Cossins.
The Journal of the Institution of Engineers, Australia, Vol. 47, No. 7-8, p 20-23, July-August, 1975. 1 fig, 4 ref.

Descriptors: *Floods, Flood control, Flood damage, Flood forecasting, Warning systems, Flood flow, Flood peak, *Australia, Public utilities, Repairing.
Identifiers: *Brisbane(Australia).

The effects of the 1974 floods on the Brisbane area of Australia are discussed. While hydrologists were busy forecasting levels, directing the operations of the flood mitigation dams and directing the measurement of flood flows, operation and maintenance engineers were occupied in securing the safety of municipal and public services. The flooding exceeded 20 meters in some areas and it lasted from a few hours in some areas to a few weeks in others. When the flooding reached its peak, activities changed from rescue to repair and rehabilitation of public facilities damaged by the flood. The objectives were to restore as rapidly as possible services of water supply, electricity, sewerage, communications and transportation. New structures were designed to replace those that had been destroyed by the flood. Funds to restore public facilities were readily available, but the private sector found it very difficult going and so work proceeded very slowly. The major lesson learned from the flooding was the need to bridge the communications gap between forecasters and public. One of the provisions built into the new flood warning scheme is the involvement of up to 300 personnel on a voluntary basis in the event of future floods. There are still two deficiencies to be worked out. The public should have access to flood records and maps as a matter of right and there is a need for a systematic study of the attitude of the public toward all aspects of flooding. (Pinto-FIRL)
W76-05059

THE APPLICATION OF A SPILLWAY FOR RIVER FLOOD CONTROL,
Thames Water Authority. London (England).
C. Van Beeston.
Water Services, Vol. 79, No. 956, p 414-418, October, 1975. 5 fig, 14 ref.

Descriptors: *Flood control, *Spillways, *River regulation, Floodgates, Control structures, Siphon, Navigation, Channels, Flood flow, Model studies.
Identifiers: Lee Valley(Eng), England, Hydraulic model study.

The application of siphon spillways to river flood control in the Lee Valley, England, is discussed. The main control structures at present comprise gates of several types. The need for control of water levels within narrow limits between low and flood flows led to the concept of an air-regulated siphon type of control. The river system consists of river and navigation channels which are in some places combined. Certain minimum depths of water are required for shipping interests. Floods have occurred in this valley several times. The one in 1947 set the design for the present river system. Recent flooding in 1968 has prompted contracts for new improvements. These contracts provide improvement at the downstream end of the river in order to provide for the additional flow capacity created by new upstream works. The operation of the gates have undergone some problems during flood conditions when the required openings are not attained, due either to moving elements or motive forces or a combination of the two. Siphons, after originally being considered dangerous, were reevaluated and were found to be acceptable if floating debris were effectively excluded from the entrance and if additional discharge capability were provided. The siphon would be of the air-regulated type to avoid violent surging. An hydraulic model study of the siphon structure was conducted in the laboratory. This model study showed that the siphon was able to discharge large debris and had acceptable discharge characteristics. (Pinto-FIRL)
W76-05098

MATHEMATICAL MODELS PREDICT CONCENTRATION-TIME PROFILES RESULTING FROM CHEMICAL SPILL IN A RIVER,
Dow Chemical U. S. A., Midland, Mich. Health and Environmental Research.
For primary bibliographic entry see Field 5B.
W76-05155

AN EFFICIENT TRANSITION DEFINITION FOR DISCRETE STATE RESERVOIR ANALYSIS: THE DIVIDED INTERVAL TECHNIQUE,
New South Wales Univ., Kensington (Australia). School of Civil Engineering; and New South Wales Univ., Kensington (Australia). Dept. of Water Engineering.
D. G. Doran.
Water Resources Research, Vol. 11, No. 6, p 867-873, December 1975. 11 fig, 10 ref.

Descriptors: *Synthetic hydrology, *Simulation analysis, *Model studies, *Stochastic processes, *Reservoirs, Reservoir operation, Reservoir yield, Reservoir storage, Inflow, Computer models, Probability.
Identifiers: *Divided interval technique, *Discretization schemes, Probability of emptiness.

Discrete state-discrete time stochastic matrix methods of reservoir analysis may be used to estimate the relationships between reservoir capacity, yield, and probability of emptiness for given inflow distributions. To avoid excessive computation and computer storage demands, these methods most commonly use methods most commonly use models in which the state variable is discretized into a small number of finite states. This, however, generally leads to inaccurate solutions. To improve computational efficiency and allow solutions with reasonable accuracy with small numbers of finite states, a method was proposed of modeling the storage process which has been called 'the divided interval technique'. This method was described, and its results compared, by means of examples, with those from the existing method. (Bender-ISWS)
W76-05161

CAPABILITY OF INTEGER PROGRAMMING ALGORITHMS IN SOLVING WATER RESOURCE PLANNING PROBLEMS,
Utah Center for Water Resources Research, Logan.
For primary bibliographic entry see Field 6A.
W76-05183

FLOOD DAMAGE.
For primary bibliographic entry see Field 6E.
W76-05206

PERSPECTIVES ON THE ARMY ENGINEERS WATER MANAGEMENT MISSION,
Corps of Engineers, Washington, D.C.
For primary bibliographic entry see Field 6E.
W76-05211

NEBRASKA FLOOD PLAIN REGULATIONS ACT.
For primary bibliographic entry see Field 6F.
W76-05224

REGULATION OF CONSTRUCTION WITHIN FLOOD PLAINS ESTABLISHED PURSUANT OF SECTION 65F, CHAPTER 19, ILLINOIS REVISED STATUTES.
For primary bibliographic entry see Field 6F.
W76-05225

CHANGES IN 1972 COLUMBUS CITY CODE (FLOOD HAZARD ORDINANCE.)
For primary bibliographic entry see Field 6F.
W76-05226

MODEL FLOOD PLAIN ZONING ORDINANCE (OHIO),
Mid-Ohio Regional Planning Commission, Columbus.
For primary bibliographic entry see Field 6F.
W76-05227

A THREE-DIRECTIONAL APPROACH TO FLOOD PLAIN MANAGEMENT, MINNESOTA EXPERIENCES,
Minnesota Dept. of Natural Resources, St. Paul.
For primary bibliographic entry see Field 6F.
W76-05228

ORDINANCE AMENDING SECTION 7-1 AND 7-2 OF ARTICLE 1 OF THE COLLIER COUNTY BUILDING CODE (FLOOD PLAIN AND COASTAL CONSTRUCTION).
For primary bibliographic entry see Field 6F.
W76-05230

AN ORDINANCE RELATING TO DRAINAGE AND FLOOD CONTROL.
For primary bibliographic entry see Field 6E.
W76-05234

FLOOD CONTROL AND FLOOD WATER CONSERVATION.
For primary bibliographic entry see Field 6E.
W76-05235

AN ORDINANCE AMENDING THE GREENSBORO CODE OF ORDINANCES WITH RESPECT TO ZONING.
For primary bibliographic entry see Field 6F.
W76-05236

LAND USE MEASURES TO HELP PREVENT FLOOD HAZARDS AND LOSSES IN FLOOD PLAIN AREAS.
For primary bibliographic entry see Field 6F.
W76-05237

AMENDMENTS TO BUILDING CODE TO PREVENT FLOOD HAZARDS AND LOSSES.
For primary bibliographic entry see Field 6F.
W76-05238

PROPOSED FLOODPLAIN REGULATIONS FOR THE GREATER ANCHORAGE AREA BOROUGH.
Greater Anchorage Area Borough, Alaska. Planning Dept.
For primary bibliographic entry see Field 6F.
W76-05239

PROPOSED PENNSYLVANIA FLOOD DISASTER PREVENTION ACT.
For primary bibliographic entry see Field 6F.
W76-05241

SAMPLE ZONING REGULATIONS FOR THE MANAGEMENT OF FLOOD HAZARD AREAS.
For primary bibliographic entry see Field 6F.
W76-05242

RURAL RESIDENTIAL WATER DEMAND IN KENTUCKY: AN ECONOMETRIC AND SIMULATION ANALYSIS,
Kentucky Water Resources Research Inst., Lexington.
For primary bibliographic entry see Field 6D.
W76-05252

HYDRAULIC DESIGN CRITERIA FOR INLAND WATERWAYS,
Kansas Univ., Lawrence. Dept. of Civil Engineering.
For primary bibliographic entry see Field 8B.
W76-05254

FLOOD PLAIN INFORMATION: FARMINGTON AND CONNECTICUT RIVERS, WINDSOR, CONNECTICUT.
Army Engineer District, Waltham, Mass.
Prepared for the Town of Windsor, March 1971. 44 p, 10 fig, 8 plates, 7 tab.

Descriptors: *Floods, *River forecasting, *Flood forecasting, *Flood profiles, *Flood plains, Floodwater, Flooding, Hurricanes, Historic floods, Flood data, Flood frequency, Ice jams, Obstructions to flow, Snowmelt, Backwater, Non-structural alternatives, Flood plain zoning, Zoning, Dams, *Connecticut, *Connecticut River.
Identifiers: Windsor(CT)Farminton River(CT), *Connecticut River(CT), Rainbow Dam(CT), Standard Project Flood, Intermediate Regional Flood.

Windsor, about 5 miles north of Hartford, is situated at the confluence of the Farmington and Connecticut Rivers. Little development has taken place in the flood plain because of past flooding. Most land is devoted to agriculture, chiefly growing tobacco, and recreation. Development in the southern part of town has been built in the flood plain but most residential development is on higher ground. The Connecticut River drains 11,250 sq mi at its mouth including 609 sq mi which are drained by the tributary Farmington River. Since 1639 the Connecticut River has overflowed about 220 times at Windsor; 145 of these occurred due to excessive spring runoff from melting snow and warm rain in March through May. Flooding has occurred in all months of the year and two tropical hurricanes caused the 2nd and 3rd highest floods. The highest flood on the Connecticut River in 1936 crested about 34 ft higher than normal flow. Great icejams formed upstream and when these broke flood waters rose to unprecedented heights. On the Farmington River the greatest flood occurred in 1955 with a peak discharge of 69,200 cfs. The 1936 flood had a peak discharge of 26,550 cfs on this river. In an Intermediate Regional Flood a peak discharge of 176,000 cfs at the confluence of the rivers is expected with an elevation about 8 ft lower than the 1936 flood. In a Standard Project Flood (SPF) on the Connecticut River the discharge would reach 313,000 cfs, equivalent to the 1936 flood. Above Rainbow Dam on Farmington River elevation during an SPF would be 2 ft higher than the 1936 flood. Sixteen flood control dams on the Farmington River reduce the effects of floods; only Rainbow Dam is within this study area. (Smith-North Carolina)
W76-05256

FLOOD PLAIN INFORMATION: WEST BRANCH DUPAGE RIVER, KRESS CREEK, AND KLEIN CREEK, DUPAGE COUNTY, ILLINOIS.
Army Engineer District, Chicago, Ill.
Prepared for the County of Dupage, Illinois, June, 1975. 42 p 18 fig, 28 plates, 7 tab.

Descriptors: *Floods, *Flood profiles, *Flood plains, Floodwater, *Flooding, Streamflow forecasting, Historic floods, *Peak discharge, Flood damage, Obstructions to flow, Snowmelt, Thunderstorms, *Non-structural alternatives, *Zoning, Dams, *Illinois.
Identifiers: Standard Project Flood, Intermediate Regional Flood, Dlupage River, West Branch(Il), Kress Creek(Il), Klein Creek(Il), Warrenville(IL), Dupage County(Il), Napervile(Il), Fawell Dam(Il), Bench marks.

Dupage County, a residential and light industrial area west of Chicago, has grown rapidly over the past 35 years. Population increases are expected to continue. Lands in the flood plains of the streams of this study are agricultural, light and dense residential, commercial and light industrial. The West Branch of the Dupage River has a drainage area of 123 sq mi. Its tributaries, the Klein and Kress Creeks, drain 14.7 and 16.5 sq mi respectively. Floods have usually resulted from heavy thunderstorms after prolonged rainfall and can occur in any season. There are 5 stream gages within this area, one in operation since 1940. Floods have occurred 16 times since 1942. The most damaging was in 1972 when many residential and commercial areas were flooded and damage was $8 million. The peak discharge on the West Branch was 5200 cfs. During an Intermediate Regional Flood a peak discharge of 5600 cfs on the West Branch, 1170 cfs on Kress Creek, and 1150 on Klein Creek are predicted. Water velocities on the West Branch will be 1.5 to 7.3 ft/sec above Fawell Dam and 2.5 to 5.5 ft/sec below the dam. This flood would rise to its peak in 19.5 hours and remain above flood stage for 105 hours. During a Standard Project Flood peak discharges of 14,140 cfs, 2670 cfs and 2610 cfs are expected on the West Branch, Kress and Klein Creeks respectively. This flood would reach its peak in 45 hours and last 372 hours. Either flood would cause substantial damage. Fawell Dam provides some flood protection, but 2 low-flow dams have no storage capacity. Dupage County has a zoning ordinance which regulates flood plains and Naperville has a flood ordinance which requires storage of storm water runoff to reduce flood damage. (Smith-North Carolina)
W76-05257

SPECIAL FLOOD HAZARD INFORMATION: DUNN BRANCH, WOODBINE, GEORGIA.
Army Engineer District, Savannah, Ga.
Prepared for the City of Woodbine, Georgia, February 1973. 5 p 13 plates.

Descriptors: *Floods, *Flood plains, *Flood profiles, *Flood proofing, *Non-structural alternatives, Hurricanes, Tides, Channels, *Georgia, Management.
Identifiers: Woodbine(Ga), Dunn Branch(Ga), *Flood plain kmanagement, Rattlesnake Creek(Ga), Stailla River(Ga), Camden County(Ga), Intermediate Regional Flood.

Dunn Branch flows in a northeasterly direction through the town of Woodbine (1970 population 1000) in Camden County, Georgia. A tributary of the Satilla River, Dunn Branch, which is affected by normal tidal fluctuations, is joined by Rattlesnake Creek east of Woodbine; these streams have a combined drainage area of 3.3 miles. Rattlesnake Creek is an improved channel now full of vegetation. Dunn Branch is relatively straight with tidal mRattlesnake Creek is an improved channel now full of vegetation. Dunn Branch is relatively straight with tidal marsh overbanks downstream of North Brewster Avenue. Stream overflow occurs fairly often causing damage to public and private property, disrupting traffic and creating a health hazard as septic tanks fail to function properly. The study area is subject to both general rainfall flooding and hurricane tidal flooding. Although the incidence of hurricanes affecting the Woodbine area has been low in the past, damages are usually heavy from tidal flooding owing to the corrosive properties of sea water and additional damage caused by high winds. Flood heights during the Intermediate Regional Flood can reach 13 feet above mean sea level on Dunn Creek near U. S. Highway 17. Suggested measures for flood plain management include flood proofing and regulations for guiding and controlling developments in flood hazard areas. (Henley-North Carolina)

W76-05258

SPECIAL FLOOD HAZARD INFORMATION: ARKANSAS RIVER AND WILD HORSE CREEK, HOLLY, COLORADO.
Army Engineer District, Albuquerque, N. Mex.
April 1975. 32 p, 4 fig, 6 plates, 4 tab.

Descriptors: *Floods, *Flood plains, *Flood protection, *Flood damage, *Flood profiles, *Nonstructural alternatives, *Flood forecasting, Flash flood, Historic floods, Flood data, Peak discharge, River Beds, Warning systems, Control structures, Levees, Dam, *Colorado.
Identifiers: Holly(CO), *Arkansas River(CO), Wild Horse Creek(CO), Two Butte Creek(CO), *Flood plain management, John Martin Reservoir(CO), Standard Project Flood, Intermediate Regioan Flood, Flood proofing.

Two Butte Creek and Wild Horse Creek enter the Arkansas River in the vicinity of Holly, a trading center for livestock and farming industry with a population of 993 in 1970, and have a drainage area 900 and 210 sq mi respectively. The contributing reach of the Arkansas River between the John Martin Reservoir and Holly has a drainage area of 5,508 sq mi and is characterized by a wide streambed, low banks, and a slope of 6 ft/mi near Holly. Five damaging floods have occurred since 1907, the worst occurring in June 1965 when the Arkansas River and Two Butte Creek had peak discharges of 200,000 and 182,000 cubic ft/sec respectively. Holly was inundated by as much as 8 ft of water and damages were estimated at $1,500,000. The Intermediate Regional Flood and the Standard Project Flood would have peak discharges of 82,000 and 160,000 cfs respectively. Flood control measures in the area include the John Martin Dam on the Arkansas River near Las Animas which is capable of detaining SPF flood flows. Levees which route the creek west of town protect Holly from flood flows of Wild Horse Creek. Discussed guidelines for flood plain management include floodway designation, zoning, subdivision regulations, building codes, development policies, flood proofing, health regulations, flood forecasting and evacuation, open spaces, urban development, warning signs, tax adjustments, and flood insurance. (Henley - North Carolina)
W76-05262

SCREENING MODEL FOR CONJUNCTIVE-USE WATER SYSTEMS,
Harza Engineering Co., Chicago, Ill.
A. S. Hamdan, and D. D. Meredith.
Journal of the Hydraulics Division, American Society of Civil Engineers, Vol. 101, No. HY10, Proceedings paper No. 11611, p 1343-1355, October 1975. 2 fig, 4 tab, 16 ref. OWRT(1-7229(No. 6200)(2).

Descriptors: *River basin development, *Alternative planning, *Conjunctive use, *Screening, *Water supply, *Reservoir operation, Networks, Groundwater, Surface waters, Optimization, Investment, Constraints, Water policy, Flow, Waater management (Applied), Water demand, Aquifers, Equations, Computers, Pipelines, Mathematical models, Systems analysis, Water allocation(Policy), Illinois.
Identifiers: Kaskaskia River basin(Ill), Cost minimization, Shadow prices, Out-of-Kilter algorithm.

Presented is a preliminary screening model for planning the conjunctive use of ground and surface water in a river basin. The model is a cost minimization flow network model, which uses the out-of-kilter algorithm as a solution technique. It is used to identify potentially optimal alternative plans, permitting determination of size of structures and scheduling (design and operating rules). If the alternative system can meet basin demands, then the least-cost plan to meet demands is identified. The out-of-kilter algorithm is used to determine the minimal cost flow through the network. Computer output provides the minimal cost allocation schedule over the planning period and the shadow prices of supplies and demands. An example problem in the Kaskaskia River basin demonstrates how the network analysis procedures can be used to determine optimum investment plans, test policy constraints, and develop policies for future development and constraints. Three alternatives (conditions of supply availability) are considered: (1) imported water, local groundwater, and existing surface reservoirs; (2) local groundwater and existing and potential surface reservoirs, but no importation; and (3) imported water, local groundwater, and existing and potential surface water reservoirs. Study results define the initial alternatives for a detailed simulation study to refine the size and operating policies of the system components. (Bell-Cornell)
W76-05268

BAYESIAN GENERATION OF SYNTHETIC STREAMFLOWS.
Resource Analysis, Inc., Cambridge, Mass.
For primary bibliographic entry see Field 2A.
W76-05271

A BAYESIAN APPROACH TO ANALYZING UNCERTAINTY AMONG FLOOD FREQUENCY MODELS,
International Inst. for Applied Systems Analysis, Laxenburg (Austria).
For primary bibliographic entry see Field 2E.
W76-05272

RESISTANCE TO FLOW IN A COMBINED CHANNEL,
Oklahoma State Univ., Stillwater. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 8B.
W76-05273

SOCIAL IMPACTS AND METHODOLOGICAL PERSPECTIVES FROM A POST AUDIT ANALYSIS OF WATER RESOURCE DEVELOPMENT,
Utah State Univ., Logan. Inst. for Social Science Research on Natural Resources.
For primary bibliographic entry see Field 6B.
W76-05360

FLOOD PROFILES AND INUNDATED AREAS ALONG THE DESCHUTES RIVER, WASHINGTON,
Geological Survey, Tacoma, Wash.
For primary bibliographic entry see Field 2E.
W76-05415

REPORT OF THE ANNUAL YIELD OF THE ARKANSAS RIVER BASIN FOR THE ARKANSAS RIVER BASIN COMPACT, ARKANSAS--OKLAHOMA,
Geological Survey, Little Rock, Ark.
T. E. Lamb.
Open-file report, 1975. 26 p, 1 fig, 3 tab, 3 ref.

Descriptors: *Basic data collections, *Streamflow, *Water yield, *River basins, *Arkansas, *Oklahoma, Gaging stations, Flow measurement, Average flow, Peak discharge, Low flow, Runoff, Interstate compacts.
Identifiers: *Arkansas River Basin Compact(Ark-Okla), Arkansas River.

The computed annual yield of subbasins in the Arkansas River basin as defined in the Arkansas River Basin Compact, Arkansas-Oklahoma, 1972, are presented. For this report, the Arkansas River basin means all of the drainage basin of the Arkansas River and its tributaries from a point immediately below the confluence of the Grand-Neosho River with the Arkansas River near Muskogee, Oklahoma, to a point immediately below the confluence of Lee Creek with the Arkansas River near Van Buren, Arkansas, together with the drainage basin of Spavinaw Creek in Arkansas, but excluding that portion of the drainage basin of the Canadian River above Lake Eufaula Dam. (Woodard-USGS)
W76-05416

A METHOD FOR ESTIMATING MAGNITUDE AND FREQUENCY OF FLOODS IN MONTANA,
Geological Survey, Helena, Mont.
M. V. Johnson, and R. J. Omang.
Open-file report 75-650, January 1976. 35 p 6 fig, 3 plates, 1 tab, 14 ref, append.

Descriptors: *Flood forecasting, *Flood frequency, *Flood peak, *Methodology, *Montana, Equations, Mathematical studies, Flood recurrence interval, Natural flow, Drainage area, Channel morphology, Watersheds(Basins), Gaging stations, Streamflow, *Estimating.
Identifiers: *Log-Pearson Type III analysis, Ungaged sites.

Methods are provided for estimating flood characteristics at most natural flow sites on rural streams in Montana. Flood data and related information for many gaged sites on Montana streams also are presented. Frequency curves are included for 442 gaged sites as defined by log-Pearson Type III analysis. To allow estimates at ungaged sites, mathematical equations relate the 2-, 5-, 10-, 25, 50-, and 100-year flood magnitudes to basin characteristics. Drainage area, main channel slope, and mean annual precipitation were the most significant estimating variables. Equations presented are limited to use on streams with drainage areas from about 0.1 to 2,600 sq mi, with slope from about 5 to 1,200 ft/mi, and with precipitation from 10 to 100 in. Nomographs provide a simple graphical means of solving the estimating relations, and illustrative examples are presented. (Woodard-USGS)
W76-05422

ANNUAL MAXIMUM STAGES AND DISCHARGES OF NORTH CAROLINA STREAMS,
Geological Survey, Raleigh, N. C.
For primary bibliographic entry see Field 7C.
W76-05423

GEOHYDROLOGIC RECONNAISSANCE AND MEASUREMENT OF PERENNIAL STREAMS CROSSING OUTCROPS OF THE MADISON LIMESTONE, NORTHEASTERN WYOMING, 1974,
Geological Survey, Cheyenne, Wyo.
For primary bibliographic entry see Field 2E.
W76-05425

TIME-OF-TRAVEL OF SOLUTES IN THE TRINITY RIVER BASIN, TEXAS, SEPTEMBER 1973 AND JULY-AUGUST 1974,
Geological Survey, Fort Worth, Tex.
For primary bibliographic entry see Field 7C.
W76-05426

WATER RESOURCES OF BASINS FOR MINOR STREAMS DRAINING INTO ST. CLAIR RIVER, LAKE ST. CLAIR, DETROIT RIVER, AND LAKE ERIE, SOUTHEASTERN MICHIGAN,
Geological Survey, Lansing, Mich.
For primary bibliographic entry see Field 7C.
W76-05427

HYDROLOGIC UNIT MAP--1974, CARIBBEAN REGION.
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 7C.
W76-05430

REMOTE SENSING,
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 7B.
W76-05431

AN INTERNATIONAL CENTRE FOR MANATEE RESEARCH.
National Academy of Sciences, Washington, D.C.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-240 244, $3.75 in paper copy, $2.25 in microfiche. Report of a workshop held February 7-13, 1974 at Georgetown, Guyana, 1974. 38 p, 13 fig., 1 tab., 17 ref. AID/csd-2584.

Descriptors: *Biocontrol, *Mammals, *Aquatic weed control, Tropical regions, Aquatic animals, Herbivores, Ecological distribution, Life cycles, Diets, Conservation, Research and development.
Identifiers: *Manatees, Guyana.

Manatees show great potential for controlling aquatic weed infestations in tropical waters. They are native to more than 40 tropical countries in the Americas and Africa and are the world's only herbivorous, totally aquatic mammal. They have been used successfully in Guyana to clear weeds from canals. Their use could enhance drainage, irrigation, hydroelectric schemes, transportation, fishing, and with proper husbandry, can be a palatable protein source for human consumption; 85% of the carcass can be used in addition to the meat. However, manatees are almost extinct. Man is their only predator. Once a colony is established in weed infested areas there are no maintenance costs. An international center for manatee research at Guyana is proposed to sponsor, promote, and coordinate activities on basic research, manatee effectiveness as aquatic weed control agents in tropical regions, to develop programs for repopulating depleted habitats, to promote conservation, to foster their domestication, and to provide guidance in planning and techniques of advanced mammalian research. An interim steering committee was appointed to organize the research center's establishment. (Buchanan-Davidson--Wisconsin)
W76-05433

USER PREFERENCES OF POLICY ALTERNATIVES: THE CASE OF RECREATIONAL USER ATTITUDES TOWARD DEVELOPMENT AND REGULATION AT LAKE MONROE, INDIANA,
Indiana Univ., Bloomington. Poplars Research and Conference Center.
For primary bibliographic entry see Field 6B.
W76-05435

AN ANALYSIS OF WATER RESOURCE BENEFIT DETERMINATION METHODS WITH SPECIAL REFERENCE TO THE COSUMNES RIVER DIVISION PROJECT,
California Univ., Davis. Dept. of Agricultural Economics.
For primary bibliographic entry see Field 6B.
W76-05441

FLOOD PROOFING DECISIONS UNDER UNCERTAINTY,
Massachusetts Univ., Amherst Dept. of Agricultural and Food Economics.
For primary bibliographic entry see Field 6F.
W76-05456

CONTROL OF AQUATIC VEGETATION IN NEW YORK STATE,
New York State Coll. of Agriculture and Life Sciences.
For primary bibliographic entry see Field 5C.
W76-05467

MECHANICAL MANAGEMENT OF AQUATIC VEGETATION: ANALYTICAL STUDIES OF UNIT OPERATIONS POTENTIALLY USEFUL IN THEIR PROCESSING,
Wisconsin Univ., Madison. Dept. of Mechanical Engineering.
For primary bibliographic entry see Field 3B.
W76-05469

WATER RESOURCES DEVELOPMENT IN THE TISZA RIVER BASIN AND ITS IMPACT ON SOCIO-ECONOMIC GROWTH,
Water Management Center, Budapest (Hungary). Dept. of Long Range Planning.
I. Z. Ballo, and I. Orloczi.
Working Paper No. 16, UNDP/UN Interregional Seminar on River Basin and Interbasin Development, Budapest, Hungary, September 1975. 27 p, 5 fig, 5 tab, 12 ref. (United Nations, Department of Economic and Social Affairs).

Descriptors: *Water resources development, *River basins, *Land use, *Water management(Applied), *Water supply, *Planning, Economics, Social aspects, Surface waters, Human population, History, Floods, Irrigation, Water pollution control, Water demand.
Identifiers: *Tisza River basin(Hungary), *Developing economies, Impact, Socioeconomic growth, Catchments, International cooperation.

A brief review is presented of the fundamental water management conditions related to land use in the Tisza River Basin, an area of great economic importance to Hungary. The time horizon surveyed comprises two centuries: from 1800 to 2000. The past, present and future socio-economic significance of the Hungarian part of the Tisza Valley is emphasized. The main stages, characteristics, problems, and results of the past 150 years' long history of increasingly complex water management are surveyed. Taking into consideration the projections for the Hungarian part of the basin presently available and the development predicted for the neighboring countries in the catchment, an attempt is made at estimating the needs likely to be raised by the growing population and the developing economic life in the region. The technico-economic and political measures outlined broadly are potential solutions to the problems formulated. Reference is made to the co-operation of the five CMEA neighboring countries and the work started is expected to provide novel experiences for the integrated development of other international river basins of the World in the near future. (Bell-Cornell)
W76-05519

4B. Groundwater Management

BIBLIOGRAPHY OF WATER RESOURCES.OF THE HAWAIIAN ISLANDS,
Hawaii Univ., Honolulu. Water Resources Research Center.
For primary bibliographic entry see Field 10C.
W76-05013

MANUAL OF INDIVIDUAL WATER SUPPLY SYSTEMS.
Environmental Protection Agency, Washington, D.C. Water Supply Div.
For primary bibliographic entry see Field 5F.
W76-05042

A SUPPLEMENTAL SOCIO-ENVIRONMENTAL DECISION TOOL: VALUE CONFLICTS ON LONG ISLAND,
Weston (Roy F.) Inc., Roslyn, N.Y.
For primary bibliographic entry see Field 5D.
W76-05049

CORROSION IN DISPOSAL WELLS,
Subsurface Disposal Corp., Houston, Tex.
For primary bibliographic entry see Field 5E.
W76-05125

THE DETECTION AND MAPPING OF SUBTERRANEAN WATER BEARING CHANNELS--PHASE II,
Missouri Univ., Rolla. Dept. of Geophysics.
R. D. Rechtien, L. W. Gardner, M. Sanders, and R. Tucker.
Available from the National Technical Information Service, Springfield, Va. 22161, as PB-250 459, $4.50 in paper copy, $2.25 in microfiche. Completion Report, June 1975. 46 p, 30 fig, 18 ref. OWRT B-087-MO(1). 14-31-0001-3909.

Descriptors: *Subsurface mapping, Subsurface investigations, *Caves, Seismic waves, Resonance, *Seismic studies, Seismographs, Mud, Exploration.
Identifiers: *Cavity resonance phenomenon, *Subterranean cavities, *Mud-filled caverns.

Field experiments were conducted over a near-surface cavern to obtain a spatial definition of the associated Cavity Resonance Phenomenon. There was no indication that resonance phenomenon for an air-filled void was measurable. A more accurate data system, consisting of a mobile laboratory housing a minicomputer its peripherals and associated test equipment, was assembled to record three-component ground velocity measurements. Traverse lines were selected across two known carbonate rock cave systems with seismometer stations at 10 foot intervals along the line. A very accurate subsurface survey was made of one passage approximately 162 feet with a uniform shape below the surface, a height ofabout 100 feet are a width of 51 feet. Reflections of caverns were evident, but not strong. Strong reflection was obtained from an unexplored arm of one cave. Test drilling showed this to be a mud-filled cavern. Later investigations showed the reverberant-type motion to be due to mud walls of the subterranean cavities. The method developed can show the presence of subterranean cavities and probably determine if they are filled or void. (See also W73-06034)
W76-05129

PUBLIC GROUNDWATER SUPPLIES IN CHAMPAIGN COUNTY,
Illinois State Water Survey, Urbana.
D. M. Woller.
Available from the National Technical Information Service, Springfield, Va. 22161 as PB-250 496, $4.50 in paper copy, $2.25 in microfiche. Bulletin 60-15, 1975. 55 p, 2 fig.

Descriptors: *Water supply, *Illinois, *Groundwater resources, *Well data, Unconsolidated aquifers, Gravels, Sand aquifers, Groundwater, Groundwater availability, Hydrology, Hydrogeology, Water resources, Water quality, Water wells, Municipal water, Water yield, Water properties, Hardness(Water), Chemical properties, Shallow wells, Deep wells, Geology.
Identifiers: *Champaign County(Ill), Dissolved minerals, Water bearing formations.

All available information was reported on production wells used for public groundwater supplies in Champaign County. The definition of public water supply as contained in the Environmental Protection Act of 1970 was used to determine those water systems and wells to be included. Sand and gravel deposits in the unconsolidated materials above bedrock are tapped as the sources for 64 public supply production and standby wells, ranging in depth from 26 to 340 ft. Reported yields range from 25 to 3000 gpm depending primarily upon the type of well and the permeability, thickness, and areal extent of the sand and gravel unit tapped by each well. Past and present analyses of water from these wells indicated that the iron content ranges from 0.0 to 7.0 mg/l, and the hardness from 194 to 460 mg/l. Individual production wells for each

supply were described in the order of their construction. The description for each well includes the aquifer tapped, date drilled, depth, driller, legal location, elevation in feet above mean sea level, log, construction features, yield, pumping equipment, and chemical analyses. (Humphreys-ISWS)
W76-05130

PUBLIC GROUNDWATER SUPPLIES IN CALHOUN COUNTY,
Illinois State Water Survey, Urbana.
D. M. Woller.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-250 495, $3.50 in paper copy, $2.25 in microfiche. Bulletin 60-16, 1975. 6 p, 1 fig.

Descriptors: *Water supply, *Illinois, *Groundwater resources, *Well data, Unconsolidated aquifers, Gravels, Sand aquifers, Groundwater, Groundwater availability, Hydrology, Hydrogeology, Water sources, Water quality, Water wells, Municipal water, Water yield, Water properties, Hardness(Water), Chemical properties, Shallow wells, Geology.
Identifiers: *Calhoun County(Ill), Dissolved minerals, Water bearing formations.

All available information was reported on production wells used for public groundwater supplies in Calhoun County, Illinois. The definition of public water supply as contained in the Environmental Protection Act of 1970 was used to determine those water systems and wells to be included. Sand and gravel deposits in the unconsolidated materials above bedrock are tapped as the source of municipal water supply. There are 7 municipal production and standby wells tapping these aquifers to depths ranging from 52 to 86.5 ft. Reported yields range from 100 to 250 gpm, depending primarily upon the type of well constructed and the permeability, thickness, and areal extent of the sand and gravel unit tapped by these supplies range in iron content from a trace to 4.5 mg/1, and in hardness from 373 to 656 mg/1, tapped by each installation. Available chemical analyses indicate that water from the sand and gravel aquifers Individual production wells for each supply were described in the order of their construction. The description for each well included the aquifer tapped, date drilled, depth, driller, legal location, elevation in feet above mean sea level, log, construction features, yield, pumping equipment and chemical analyses. (Humphreys-ISWS)
W76-05131

PUBLIC GROUNDWATER SUPPLIES IN MASSAC COUNTY,
Illinois State Water Survey, Urbana.
D. M. Woller.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-250 453, $3.50 in paper copy, $2.25 in microfiche. Bulletin 60-14, 1975. 8 p, 1 fig.

Descriptors: *Water supply, *Illinois, *Groundwater resources, *Well data, Aquifers, Unconsolidated aquifers, Gravels, Sand aquifers, Limestones, Groundwater, Groundwater availability, Hydrology, Hydrogeology, Water resources, Water quality, Water wells, Municipal water, Water yield, Water properties, Hardness(Water), Chemical properties, Shallow wells, Deep wells, Geology.
Identifiers: *Massac County(Ill), Dissolved minerals, Water bearing formations.

All available information was reported on production wells used for public groundwater supplies in Massac County, Illinois. The definition of public water supply as contained in the Environmental Protection Act of 1970 was used to determine those water systems and wells to be included. Unconsolidated sand and gravel deposits associated with the Ohio and Cache River Valleys and semi-consolidated sand, silt, and gravel in the southern two-thirds of the county are tapped as sources of municipal water supplies. Seven public supply wells tap these aquifers to depths ranging from 96 to 270 ft. Their reported yields range from 94 to 1000 gpm depending primarily on the type of well constructed and the permeability, thickness, and areal extent of the sand and gravel unit tapped by each well. Past and recent analyses of water they produce indicated that the iron content ranges from 0.3 to 3.4 mg/1 and the hardness from 172 to 217 mg/1. A consolidated limestone aquifer of Mississippian age is tapped for public water supplies by four wells ranging from 240 to 448 ft deep. Reported yields range from 73 to 1800 gpm. Analyses of water they produce indicated that the iron content ranges from 0.3 to 3.4 mg/1 and the hardness from 200 to 280 mg/1. Individual production wells for each supply were described in the order of their construction. The description for each well includes the aquifer tapped, date drilled, depth, driller, legal location, elevation in feet above mean sea level, log, construction features, yield, pumping equipment and chemical analyses. (Humphreys-ISWS)
W76-05132

EXPANSION OF SALT-WATER ZONE DUE TO WELL DISCHARGE,
North Carolina State Univ., Raleigh. Dept. of Civil Engineering.
For primary bibliographic entry see Field 2L.
W76-05133

QUALITY OF WELL-WATERS OF NORTHERN MADHYA PRADESH,
College of Agriculture, Parbhani (India).
R. B. Somavanshi, and S. B. Sinha.
Indian J Agric Sci. 42(11): 1007-1010, 1972.

Descriptors: *Water quality, *Water wells, Asia, Irrigation water, Ions, Salinity, Cations, Anions, Alkalinity, *Calcium, *Magnesium, Sulfates, Carbonates, Chlorides, Boron, Nitrates, Groundwater.
Identifiers: *India(Northern Madhya Pradesh).

Samples of irrigation waters were collected from 117 places from Gwalior and Bhind, in the northern districts of Madhya Pradesh, India, and tested for suitability for irrigation. The dominating cations were the divalent ions Ca++ and Mg++, and the dominating anions were bicarbonate, chloride and sulfate. The concentration of B was within permissible limits, but that of nitrate varied widely. Some constants like SAR (Na Adsorption ratio), RSC (residual Na2CO3) and Kelly's ratio, which are generally used as indices of alkali hazard, were also calculated. Their values for most waters were within safe limits. A significant positive correlation existed between RSG and SAR, and between RSC and Kelley's ratio. More than 80% of the samples had low alkalinity, and 53% had no residual Na2CO3 at all. Of the samples, 94% had medium to high salinity, 4% had low and only 2% had very high salinity. The waters are of medium to high salinity but show low alkali hazard. Gwalior waters are better than Bhind waters for irrigation.--Copyright 1974, Biological Abstracts, Inc.
W76-05146

POLLUTION EFFECTS ON SURFACE AND GROUND WATERS, (LITERATURE REVIEW),
Hawaii Univ., Honolulu. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5B.
W76-05176

SOURCES OF CONTAMINATION OF ARTESIAN WATERS BY CARCINOGENIC HYDROCARBONS, (IN RUSSIAN),
For primary bibliographic entry see Field 5B.
W76-05265

MEAN ANNUAL RUNOFF IN CENTRAL ASIA AND WESTERN KAZAKH DESERTS, (IN RUSSIAN),
Desert Inst., Ashkhabad (USSR).
For primary bibliographic entry see Field 2E.
W76-05304

GUIDELINES FOR THE SELECTION OF TURBINE PUMP MATERIALS FOR USE IN GROUNDWATERS,
Queensland Univ., Brisbane (Australia). Dept. of Chemical Engineering.
For primary bibliographic entry see Field 8G.
W76-05406

STRATIGRAPHIC AND HYDROLOGIC RELATIONSHIP OF THE PINEY POINT AQUIFER AND THE ALLOWAY CLAY MEMBER OF THE KIRKWOOD FORMATION IN NEW JERSEY,
Geological Survey, Mineola, N.Y.
For primary bibliographic entry see Field 2F.
W76-05412

GROUND WATER DEVELOPMENT AND POTENTIAL IN WADIS KHULAYS AND FATIMAH, SAUDI ARABIA,
Geological Survey, Reston, Va.
P. E. Ward.
Open-file report, July 1975. 22 p, 2 fig, 4 ref.

Descriptors: *Groundwater potential, *Groundwater availability, *Water resources development, *Arid lands, *Foreign countries, Foreign research, Foreign projects, Hydrologic data, Reviews, Aquifer characteristics, Water supply, Groundwater recharge, Evaluation.
Identifiers: *Saudi Arabia(Wadis Khulays and Fatimah), Groundwater management.

Many of the wells and water distribution facilities supplying the cities of Jeddah and Mecca in Saudi Arabia were destroyed or severely damaged during the flooding in late March and early April 1975. The U.S. Army Corps of Engineers, who was repairing the damage, wanted to know if additional groundwater could be developed in Wadis Fatimah and Khulays where the well fields are located. Available information indicates that there has been a substantial overdraft of groundwater from Wadi Fatimah during the past few years. Any substantial increase in the withdrawal from Wadi Khulays will also result in overdraft. There appears to be potential for making additional groundwater available by retarding flow runoff in the wadis, thereby allowing the water more time to percolate to the groundwater reservoirs. (Woodard-USGS)
W76-05419

WATER-LEVEL RECORDS FOR THE NORTHERN HIGH PLAINS OF COLORADO, 1972-76,
Geological Survey, Denver, Colo.
For primary bibliographic entry see Field 7C.
W76-05420

GROUND-WATER DATA NEAR THE NORTHWEST SHORE OF TOPAZ LAKE, DOUGLAS COUNTY, NEVADA,
Geological Survey, Carson City, Nev.
For primary bibliographic entry see Field 7C.
W76-05424

DISTRIBUTION OF DIFFERENT QUALITIES OF UNDERGROUND WATERS IN REWARI TEHSIL OF HARYANA STATE,
Haryana Agricultural Univ., Hissar (India).
For primary bibliographic entry see Field 3C.
W76-05432

DESIGN OF GROUND WATER LEVEL OBSERVATION-WELL PROGRAMS,
Geological Survey, Raleigh, N. C. Water Resources Div.
R. C. Heath.
Ground Water, Vol. 14, No. 2, p. 71-77, March-April 1976, 4 fig., 2 tab.

Descriptors: *Observation wells, *Network design, Hydrologic data, Discharge measurement, Recharge, Measurement, Aquifers, Data collections, Water level fluctuations, Water wells, *Withdrawal, *Groundwater recharge.

Data obtained from observation-well programs are used to determine: (1) the effect of withdrawals on recharge and natural discharge conditions, (2) the hydraulic characteristics of ground-water systems, and (3) the extent and degree of confinement of aquifers. Wells in these programs can be divided into three networks: (1) a hydrologic network which includes wells needed to determine the extent of aquifers and changes in storage; (2) a water-management network which includes wells needed to determine the effect of withdrawals and hydraulic characteristics; and (3) a baseline network which includes wells needed to determine the response of ground-water systems to natural changes such as those related to climate. (Heiss-NWWA)
W76-05451

4C. Effects On Water Of Man's Non-Water Activities

ROOKERY BAY LAND USE STUDIES, ENVIRONMENTAL PLANNING STRATEGIES FOR THE DEVELOPMENT OF A MANGROVE SHORELINE, STUDY NO. 7, POLICY AND REGULATORY DIMENSIONS,
Conservation Foundation, Washington, D. C.
For primary bibliographic entry see Field 5G.
W76-05007

ROOKERY BAY LAND USE STUDIES, ENVIRONMENTAL PLANNING STRATEGIES FOR THE DEVELOPMENT OF A MANGROVE SHORELINE, STUDY NO. 9, PRINCIPLES OF ECOSYSTEM MANAGEMENT,
Conservation Foundation, Washington, D.C.
For primary bibliographic entry see Field 5G.
W76-05008

ROOKERY BAY LAND USE STUDIES, ENVIRONMENTAL PLANNING STRATEGIES FOR THE DEVELOPMENT OF A MANGROVE SHORELINE, STUDY NO. 10, GROWTH AND LAND USE, STUDY NO. 11, ECONOMIC IMPLICATIONS OF LAND DEVELOPMENT ALTERNATIVES, STUDY NO. 12, A SIMULATION MODELING APPROACH TO THE STUDY OF DEVELOPMENT ALTERNATIVES,
For primary bibliographic entry see Field 5G.
W76-05009

THE IMPACT OF SALT MANUFACTURING ON MANGROVE VEGETATION AND THE GEOMORPHOLOGY IN LOWER-DAHOMEY, (IN FRENCH),
Dahomey Univ., Porto Novo. Botany Lab.
G. Paradis, and E. Adjanohoun.
Ann Univ Abidjan Ser E Ecol. 7: 599-612. 1974.

Descriptors: *Salts, *Vegetation, Industries, Marshes, Geomorphology, Erosion, Organic soils, *Mangrove mashes, Grasslands, *Grasses.
Identifiers: Avicennia, Paspalum-Vaginatum, Rhizophora, Sesuvium-Portulacastrum, *Mangrove trees, *Dahomey (France).

The salt industry in Dahomey, which has been traced back to at least 1734, has contributed to a change in the appearance of mangrove trees in Dahomey. There has been great destruction of Rhizophora and Avicennia, and they have been replaced by grasslands with Paspalum Veginatum and Sesuvium portulacastrum. The geomorphology has also been affected, with creation of marshes and buttes, and probable erosion of the organic soil. Copyright 1975, Biological Abstracts, Inc.
W76-05113

PETROLEUM INPUTS TO THE MARINE ENVIRONMENT FROM LAND SOURCES,
Engineering-Science, Inc., Berkeley, Calif
For primary bibliographic entry see Field 5B.
W76-05140

ESTIMATES OF ANNUAL INPUT OF PETROLEUM TO THE MARINE ENVIRONMENT FROM OFFSHORE PRODUCTION OPERATIONS,
Exxon Production Research Co., Houston, Tex. Geologic Research.
For primary bibliographic entry see Field 5B.
W76-05142

WESTERNPORT BAY ENVIRONMENTAL STUDY 1973-1974.
Victoria Ministry for Conservation, Melbourne (Australia). Westernport Bay Environmental Study.
For primary bibliographic entry see Field 6G.
W76-05404

COUPLED SOIL MOISTURE, HEAT AND WATER VAPOUR TRANSFERS UNDER SIMULATED FIRE CONDITIONS,
Commonwealth Scientific and Industrial Research Organization, Canberra (Australia). Div. of Plant Industry.
For primary bibliographic entry see Field 2G.
W76-05410

EFFECTS OF LAND USE AND RETENTION PRACTICES ON SEDIMENT YIELDS IN THE STONY BROOK BASIN, NEW JERSEY,
Geological Survey, Ithaca, N.Y.
L. J. Mansue, and P. W. Anderson.
Water-Supply Paper 1798-L, 1974. 33 p, 11 fig, 8 tab, 20 ref.

Descriptors: *Sediment transport, *Sediment yield, *Particle size, *Small watersheds, *New Jersey, Sedimentation, Environmental effects, Land use, Construction, Urbanization, Agriculture, Streamflow, Storms, Data collections, Sediment control.
Identifiers: *Stony Brook basin(NJ).

The average annual rate of suspended-sediment discharge of the Stony Brook at Princeton, N.J. (44.5 square miles) is about 8,800 tons, or 200 tons per square mile. Annual yields within the basin, which is in the Piedmont Lowlands section of the Piedmont physiographic province in west-central New Jersey, range from 25 to 400 tons per square mile. Storm runoff that transport suspended materials in excess of a ton carries 90 percent of the total suspended-sediment discharge from the basin. Suspended material carried during storms is 55 percent silt, 40 percent clay, and 5 percent sand. A trend analysis of sediment records collected at Princeton between 1956 and 1970 indicated an increase in suspended-sediment discharge per unit of water discharge during 1956-61. From early 1962 to late 1967, sediment trends were difficult to interpret owing to complicating factors, such as reservoir construction, urbanization, and extreme drought. After 1967, yields decreased. (Woodard-USGS)
W76-05418

4D. Watershed Protection

GEOHYDROLOGY OF KARST TERRAIN, LOST RIVER WATERSHED, SOUTHERN INDIANA,
Indiana Univ., Bloomington, Water Resources Research Center.
For primary bibliographic entry see Field 2F.
W76-05004

EFFECTS OF LAND USE AND RETENTION PRACTICES ON SEDIMENT YIELDS IN THE STONY BROOK BASIN, NEW JERSEY,
Geological Survey, Ithaca, N.Y.
For primary bibliographic entry see Field 4C.
W76-05418

WATER RESOURCES OF THE MISSISSIPPI AND SAUK RIVERS WATERSHED, CENTRAL MINNESOTA,
Geological Survey, St. Paul, Minn.
For primary bibliographic entry see Field 7C.
W76-05428

WATER RESOURCES OF THE HURON RIVER BASIN, SOUTHEASTERN MICHIGAN,
Geological Survey, Grayling, Mich.
For primary bibliographic entry see Field 7C.
W76-05429

5. WATER QUALITY MANAGEMENT AND PROTECTION

5A. Identification Of Pollutants

ROOKERY BAY LAND USE STUDIES, ENVIRONMENTAL PLANNING STRATEGIES FOR THE DEVELOPMENT OF A MANGROVE SHORELINE, STUDY NO. 3, ESTUARINE WATER QUALITY,
Conservation Foundation, Washington, D. C.
For primary bibliographic entry see Field 5G.
W76-05005

PHYSICOCHEMICAL TRANSFORMATIONS OF SEWAGE EFFLUENT RELEASES IN AN EPHEMERAL STREAM CHANNEL,
Arizona Univ., Tucson. Dept. of Hydrology and Water Resources.
P. G. Sebenik.
Available from the National Technical Information Service, Springfield, Va. 22161, as PB-250 130, $5.50 in paper copy, $2.25 in microfiche. Master of Science Thesis, 1975, 88 p, 17 fig, 7 tab, 50 ref. OWRT A-040-ARIZ(1).

Descriptors: *Physicochemical properties, *Sewage effluents, *Waste water(Pollution), *Sewage disposal, *Nitrogen cycle, *Mathematical models, Biological properties, Chemical analysis, Water pollution sources, Sewage, Nitrates, Sewage treatment, Water quality, Nitrogen fixation, Nitrification, Nitrogen compounds, Nitrogen fixing bacteria, Computer models, Hydrographs, Hydrogen ion concentration, Ephemeral streams, Water pollution, Groundwater.
Identifiers: *Nitrogen transformation, Kinematic wave model.

The overall objective was to examine various transformations occurring within the Santa Cruz River channel (a desert stream located near Tucson, Arizona) during sewage effluent releases into the channel. An attempt is made to characterize spatial and temporal changes in the physical and chemical composition of sewage effluent downstream, to evaluate various mathematical

models for prediction of sewage effluent hydrographs and nitrogen species transformations occurring at various downstream locations, and compare actual and predicted values of sewage effluent hydrographs and nitrogen species transformations for specific models. Water quality samples were taken in sequence so that incremental flows at different hydrograph stages could be traced as the effluent moved downstream. Hydrographs obtained from two H-L flumes were used to calibrate a modified kinematic wave model and hydraulic parameters from the kinematic model and physicochemical measurements from water quality samples were combined into a statistical-empirical kinetic model of nitrogen trasformations which may occur in sewage effluent releases. Fair agreement was found between the nitrogen species values calculated with the model and the measured data. Measured nitrogen species values indicated that the rate of nitrification in sewage effluent releasees is related to flow distance and physical characteristics of the stream. A review of the nitrogen cycle and nitrogen transformation processes is included. (Robinett-Arizona)
W76-05018

EVALUATION OF WATER LABORATORIES, RECOMMENDED BY THE UNITED STATES PUBLIC HEALTH SERVICE.
Public Health Service, Washington, D.C. Bureau of State Services.
For primary bibliographic entry see Field 5G.
W76-05041

A PILOT STUDY OF DRINKING WATER SYSTEMS AT BUREAU OF RECLAMATION DEVELOPMENTS.
Environmental Protection Agency, Washington, D.C. Water Supply Div.
For primary bibliographic entry see Field 5F.
W76-05043

INTERFERENCES IN THE ELECTROANALYTICAL DETERMINATION OF COPPER AND LEAD IN WATER AND WASTE WATER,
University of Strathclyde, Glasgow (Scotland). Dept. of Civil Engineering.
D. Barnes, B. G. Cooksey, B. Metters, and C. Metters.
Proceedings of the Analytical Division of The Chemical Society, Vol. 12, No. 9, p 251-252, September, 1975. 2 fig, 1 tab, 10 ref.

Descriptors: *Copper, *Lead, *Waste water(Pollution), *Pollutant identification, Calibrations, Acidity, Sewage, Analytical techniques, Chemical analysis, Activated sludge, Particle size, Centrifugation, Polarographic analysis, Water analysis.
Identifiers: *Electroanalysis, Anodic stripping voltametry, Calibration graphs.

Heavy metals can exist in aqueous solutions in dissolved, precipitated, complexed, and adsorbed forms. Toxicity, treatment efficiency, and concentration determinations are affected by the form. Electroanalytical techniques are useful in that they are sensitive, non-destructive, and informative. Samples of final effluent from an activated sludge process were analyzed by d. c. polarography, anodic stripping voltametry, particle size analysis, and atomic absorption spectrometry. Lead was added to the sewage at concentrations of 1-20 parts per million (ppm), and these solutions were analyzed by d. c. polarography. The lead did not exist in a free soluble form at pH 7. The calibration graphs were curved. When the acidity was increased the calibration graphs were straight lines. Similar results were obtained with copper. At lower concentrations of lead, anodic stripping voltametry was used. Calibration graphs still were curved at a pH of 7, and became straight lines when the solution acidity was raised. Graphs for centrifuged samples were more linear than for uncentrifuged samples. Combined particle size analysis, centrifugation and suspended solids addition showed that adsorption can occur at low concentrations (on the order of parts per billion). At higher concentrations, the adsorption sites are saturated. The chemical form of metals in solution is dependent upon: pH; the concentration of the metal; the amounts of organic material and suspended solids; and the concentration and type of anion. (Pinto-FIRL)
W76-05045

AUTOMATED DETERMINATIONS OF DISSOLVED ORGANIC CARBON IN LAKE WATER,
Canada Center for Inland Waters, Burlington, (Ontario).
P. D. Goulden, and P. Brooksbank.
Analytical Chemistry, Vol. 47, No. 12, p 1943-1946, October, 1975. 2 fig, 2 tab, 5 ref.

Descriptors: *Organic materials, *Automation, *Analytical techniques, *Water analysis, *Great Lakes, Carbon dioxide, Ultraviolet irradiation, Oxidation, *Pollutant identification, Carbon.
Identifiers: *Dissolved organic carbon(DOC).

Several automated methods for the determination of dissolved organic carbon (DOC) in water from the Great Lakes were compared. Dissolved organic material, which may represent degradation of animal or plant products, or pollution by sewage, is measured by the oxidation of the organic material with subsequent measurement of carbon dioxide. Inorganic carbonate must be removed prior to the oxidation step. In these examples, the inorganic carbonate was removed by stripping the carbon dioxide from an acidified sample in a heated packed column. The two alternative methods of oxidation were compared, using ultraviolet irradiation and silver-catalyzed peroxydisulfate at 95 C. It was found that ultraviolet irradiation will oxidize all the organic materials. The silver-catalyzed peroxydisulfate method was convenient and precise but oxidized only 97% of the naturally occurring organic materials. For all the systems, using wet oxidation for high sensitivity, the limit for detection of carbon was 10 micrograms/liter and the analysis rate was 20 samples per hour. (Kramer-FIRL)
W76-05047

POTABLE WATER QUALITY IN RURAL GEORGETOWN COUNTY,
South Carolina State Coll., Orangeburg. Dept. of Natural Sciences.
S. S. Sandhu, P. Nelson, and W. J. Warren.
Bulletin of Environmental Contamination and Toxicology, Vol. 14, No. 4, p 465-472, October, 1975. 1 fig, 3 tab, 20 ref.

Descriptors: *Water quality, *South Carolina, *Potable water, Chemical analysis, *Pollutant identification, *Rural areas, Inorganic compounds, Waste water(Pollution).
Identifiers: Georgetown County(SC).

The drinking water quality of rural homes and communities in Georgetown County, South Carolina, was investigated in order to determine: the level of inorganic constituents; whether they exceed federally recommended limits; and whether pollution sources can be identified. Drinking water supplies in 161 rural communities were selected for sample collection. Samples were chosen that had not been chlorinated or otherwise pretreated. Samples were analyzed according to standard methods for pH, temperature, chlorides, nitrates, total residues, turbidities, sodium, fluoride, copper, iron, manganese, zinc, and mercury. Results showed that most of the waters were slightly acidic. Low but acceptable concentrations of chloride, copper, fluoride, sodium, cadmium, nitrate, and phosphate were found. Some water samples showed higher than recommended levels of arsenic, mercury, zinc, and lead. Two percent of the samples exceeded the mandatory limit of 0.05 parts per million (ppm) for arsenic, and 72% exceeded the recommended level of 0.01 ppm. Mandatory limits for manganese and iron were exceeded in 37% and 88% of the waters, respectively. The high iron content was responsible for the high turbidity found in 45% of the samples. Well depth and consumer income affected water quality. Septic tank seepage was partially responsible for nitrate, phosphate, iron, and arsenic contaminations. Lead concentrations depended on the plumbing and the pH. (Pinto-FIRL)
W76-05050

COMPARATIVE ATOMIC ABSORPTION SPECTROSCOPIC STUDY OF TRACE METALS IN LAKE WATER,
Limnetics, Inc., Milwaukee, Wis.
T. Surles, J. R. Tuschall, and T. T. Collins.
Environmental Science and Technology, Vol. 9, No. 12, p 1073-1075, November, 1975. 3 tab, 10 ref.

Descriptors: *Trace elements, *Metals, Spectroscopy, Chemical analysis, *Pollutant identification, Chelation, *Lake Michigan, *Analytical techniques, Instrumentation.
Identifiers: *Atomic absorption spectroscopy, Flameless atomic absorption spectroscopy, Chelation/extraction technique, Perkin-Elmer Model 306, Deuterium Background Corrector.

The advantages of flameless atomic absorption spectroscopy over the conventional flame technique include: lower detection limits; less sample pretreatment; smaller sample size; rapid analysis; and a greater variety of samples. However, there is still controversy over the precision and accuracy of the flameless technique. The precision and accuracy of the flameless method as compared to the flame technique and the chelation/solvent extraction method is demonstrated. A Perkin-Elmer Model 306 atomic absorption spectrophotometer was used with a Deuterium Background Corrector in the study. Nitric acid was used as a final cleaning agent. Composite water samples were taken from six different locations along Lake Michigan's western shoreline. The chelation/extraction method and the flameless method were used to determine the concentrations of cadmium, zinc, copper, chromium, manganese, lead, and nickel in the water. It was possible to analyze wide ranges or concentrations without prior dilution or concentration with the flameless method. In order to work in the same range as the flameless method, the chelation/extraction method required tedious preconcentration of the sample. Concentrations for some of the metals were too low to be determined by the chelation/extracton method. One problem with this method is the probable loss of metal in the chemical procedure of the extraction technique. When radioactive cadmium was used as a sample, the flameless technique showed results that were in better agreement with radioactive techniques than did the chelation/extraction method. (Pinto-FIRL)
W76-05051

SEASONAL OCCURRENCE AND DISTRIBUTION OF MICROBIAL INDICATORS AND PATHOGENS IN THE RHODE RIVER OF CHESAPEAKE BAY,
Maryland Univ., College Park. Dept. of Microbiology.
For primary bibliographic entry see Field 5B.
W76-05052

THE RATE OF PSYCHROPHILIC AND MESOPHILIC BACTERIA IN DIFFERENTLY POLLUTED WATERS OF BUDAPEST (A PSYCHROPHIL ES A MESOPHIL BAKTERIUMOK SZAMANAK ARANYA KUELOENBOEZO SZENNYEZETTSEGII BUDAPESTI VIZEKBEN),
L. Nemedi, and G. Petrasko.

Egeszsegtudomany, Vol. 19, No. 3, p 239-525, 1975. 2 fig, 4 tab, 23 ref.

Descriptors: *Waste water treatment, *Bacteria, *Water quality, *Water pollution, Analytical techniques, *Pollutant identification.
Identifiers: *Mesophilic bacteria, *Psychrophilic bacteria.

The kinetics of psychrophilic and mesophilic bacteria populations in water with different levels of pollution were studied. Two different culturing techniques for bacteria enumeration were employed. The mean values of bacterium counts were found to be consistently higher with gelatin plate pouring (incubationat 20 C for 4 days) than with agar plate pouring (incubation at 37 C for 2 days). Because of this variation, the hygienic limit values of the two parameters can not be determined in identical values. The psychrophilic count was found to be more strongly correlated with the fecal pollution of waters than was the mesophilic count. The proportion of psychrophilic and mesophilic bacterium counts varied between 3.2 and 20. The relative frequency of the two bacteria populations observed in the polluted waters of Budapest is presented. The extent to which the different culturing methods might modify the water analysis based on the bacterium count is discussed. It is stressed that the hydrobiological and hygienic value of the bacterium count varies. (Orr-FIRL)
W76-05053

TOTAL OXYGEN DEMAND,
Northumbrian Water Authority, Gosforth (England).
B. D. Ravenscroft.
Proceedings of the Analytical Division of the Chemical Society, Vol. 12, No. 9, p 254-255, September, 1975.

Descriptors: *Oxygen, *Biochemical oxygen demand, *Chemical oxygen demand, Chemical analysis, Waste water(Pollution), *Pollutant identification, Equipment, Instrumentation, Measurement, Carbon, Analytical techniques.
Identifiers: Permangate value, Total carbon, Total organic carbon, *Total oxygen demand.

Deficiencies and delays in classical methods of oxygen demand measurements on waste water and new rapid determination methods are discussed. Biochemical oxygen demand (BOD), chemical oxygen demand (COD), and permangate value (PV) measurements have given way to total carbon (TC), total organic carbon (TOC) and total oxygen demand (TOD) techniques. In the TOD instrument discussed, the sample is catalytically burned at 900 C with a small and constant stream of oxygen. This instrument is more accurate in the 0-500 mg/liter of TOD and 0-1000 mg/liter of TOD ranges than in the 0-50 mg/liter of TOD range. Dissolved and suspended solids can be handled with this instrument, as long as they are smaller than 200 microns. The oxidation efficiency at 900 C for the TOD measurements is greater than that for the COD measurements. Dissolved oxygen and nitrates in the sample will interfere with TOD measurements, and so must be either corrected for or eliminated. Effects from other anions are negligible. Heavy metals may poison the catalyst. Correlations between TOD, COD, and BOD are dependent on the composition of the waste water being studied. Industrial applications include: on-line operation to protect from spills; detection of losses where expensive products are made; and industrial final effluent monitoring. (Pinto-FIRL)
W76-05056

CONTROLLING WATER POLLUTION,
World Health Organization, Geneva (Switzerland). Control of Environmental Pollution and Hazards.
For primary bibliographic entry see Field 5G.
W76-05061

THE USE OF ADENOSINE TRIPHOSPHATE MEASUREMENTS IN THE CONTROL OF THE ACTIVATED SLUDGE PROCESS BY THE SOLIDS RETENTION TIME METHOD,
University Coll., Cardiff (Wales). Dept. of Microbiology.
For primary bibliographic entry see Field 5D.
W76-05065

COMPARISON OF THE NEW MILLIPORE HC WITH CONVENTIONAL MEMBRANE FILTERS FOR THE ENUMERATION OF FECAL COLIFORM BACTERIA,
Massachusetts Univ., Waltham. Dept. of Environmental Sciences.
B. L. Green, E. Clausen, and W. Litsky.
Applied Microbiology, Vol. 30, No. 4, p 697-699, October, 1975. 3 tab, 2 ref.

Descriptors: *Coliforms, *Pollutant identification, *Analytical techniques, Laboratory tests, *Membranes, Public health, Standards, Water quality control.
Identifiers: *Membrane filters, Millipone HC membranes.

Membrane filters currently used to determine the extent of fecal coliform pollution have a retention pore size of 0.45 micrometers and varying surface pore diameters. It has been shown that the recovery of fecal coliforms could be increased by modifying the surface pore morphology of the membrane. In this investigation, fecal coliform recovery from polluted water using six types of commercially available membrane filters was compared. The samples were taken from nonchlorinated sewage effluent, and surface waters receiving sewage, farm runoff, and industrial waste water. The membranes tested included: Millipore HA; Millipore HC; Gelman GN-6; Schleicher & Schuell; Sartorius nitrocellulose; and, Johns-Manville. The mean fecal coliform counts on the six test filters are presented. Confirmation ranged from 91.0 to 93.8 percent and indicated no significant differences between the membranes. A statistical analysis performed on the observed differences in count showed that no significant differences between variances of different filter types, however, the differences in mean count were highly significant. The membrane types can be ranked in order of fecal coliform recovery as follows: Millipore HC>Gelman>Johns-Manville and Sartorius>Millipore HA>Schleicher & Schuell. (Orr-FIRL)
W76-05069

ELEMENTAL ANALYSIS OF WASTEWATER SLUDGES FROM 33 WASTEWATER TREATMENT PLANTS IN THE UNITED STATES,
National Environmental Research Center, Cincinnati, Ohio. Advanced Waste Treatment Research Lab.
For primary bibliographic entry see Field 5D.
W76-05080

PRELIMINARY SUMMARY OF SLUDGE DEGRADATION STUDIES IN A MARINE BENTHIC ENVIRONMENT,
Pacific Northwest Environmental Research Lab., Corvallis, Oreg.
For primary bibliographic entry see Field 5C.
W76-05086

BIOASSAY METHODS AND IMPACT EVALUATION OF OCEAN DISPOSAL SITES,
Mounmouth Coll., West Long Branch, N. J.
D. Dorfman, and J. M. McCormick.
In: Research Symposium on Pretreatment and Ultimate Disposal of Wastewater Solids, May 21-22, 1974, New Brunswick, New Jersey, Rutgers University, p 391-415. 4 fig, 2 tab, 23 ref.

Descriptors: *Bioassay, *Sludge disposal, *Disposal, Effluents, Biochemical oxygen demand, Chemical oxygen demand, Dissolved oxygen, Benthic flora, Benthic fauna, Water table, Waste disposal, Toxins, Nutrients, Pollutant identification.
Identifiers: *Impact evaluation, Land disposal, *Ocean disposal sites, Sub-lethal tests.

Some disadvantages of land disposal of effluents and sludges include lack of adequate space; adverse effects on the water table; aesthetics; and high costs. Discharges into ocean waters will probably expand in the future but the oceans' capacity for wastes is not limited. Large quantities of ocean disposed effluents and sludges can result in increased nutrients and toxicants, biochemical and chemical oxygen demand, direct or indirect reduction in the dissolved oxygen, altered salinities, increased turbidity and temperatures, smothered benthic organisms, and a number of synergistic and antagonistic reactions. Bioassay methods and impact evaluation techniques in relation to these problems are discussed. A number of both laboratory and field procedures are available to perform bioassays, but to perform them on marine water some modifications are necessary due mainly to the presence of salt water and the quality of the waters. Two types of bioassays are considered. A static bioassay is one in which the test organisms are maintained in vessels containing solutions of various dilutions of the toxic material. In the flow through bioassay the test solution is allowed to flow in and out of the vessel containing the test organisms, maintaining a constant chemical environment. This is preferred for long term assays. Sub-lethal tests that can be performed include biochemical studies, pathological studies, physiological studies, growth studies, behavior studies, photosynthesis studies and taste tests. Field observations can provide the only direct evidence of the effects of ocean waste on the flora and fauna. A multidisciplinary approach, using both field and laboratory tests appears to be the most satisfactory. (See also W76-05079) (Pinto-FIRL)
W76-05087

MODEL 6-D IN-SITU WATER QUALITY ANALYZER (SURVEYOR) HYDROLAB CORPORATION, AUSTIN, TEXAS 78766.
National Oceanic and Atmospheric Administration, Washington, D. C.; and National Ocean Survey, Rockville, Md.
Available from the National Technical Information Service, Springfield, Va. 22161, as COM-75 10016, $3.25 in paper copy, $2.25 in microfiche. National Oceanographic Instrumentation Center Instrument Fact Sheet, IFS-75004, October, 1974. 15 p, 7 fig.

Descriptors: *Instrumentation, *Analytical techniques, Water quality, *Dissolved oxygen, *Hydrogen ion concentration, *Temperature, *Conductivity, Operation, Model studies, Water quality control, Equipment, *Pollutant identification.

This fact sheet describes the Hydrolab Corporation's Model 6D In-situ Water Quality Analyzer (Surveyor). The instrument system is portable and measures conductivity, temperature, dissolved oxygen, and pH. Each parameter is measured by a separate sensor contained within the underwater housing or Sonde. Operating power is supplied by a surface control unit and a signal output is displayed on a panel meter. Details are provided on the manufacturer's specifications, performance tests, environmental tests, and on the functions of the National Oceanographic Instrumentation Center. (Kramer-FIRL)
W76-05091

DETECTION OF SALMONELLAE IN THE ENVIRONMENT,
Center for Disease Control, Atlanta, Ga.
B. M. Thomason, J. W. Biddle, and W. B. Cherry.

Applied Microbiology, Vol. 30, No. 5, p 764-767, November, 1975. 4 tab, 9 ref.

Descriptors: *Salmonella, *Environmental effects, *Pollutant identification, Hazards, Coliforms, Forests, Mountains, Granites, Hardwood, Public health, Water pollution effects.
Identifiers: Granite mountain, Hardwood forest.

It has been suggested that salmonellae may be free living in nature since they have been found in waters devoid of fecal contamination. They may also be a better indication of a health hazard than the standard coliform count. The incidence of salmonellae in a harsh and unfavorable environment was determined as compared with that of a lush hardwood forest characterized by abundant moisture and moderate temperature. Samples were taken from two sites: one was a mature hardwood forest which is protected against casual human intervention but which had many warm and cold blooded vertebrates; the other the top of a granite mountain which receives heavy human usage, but can support only a small animal population. Water, algae, mosses, tree roots, grasses, and soils were collected for sampling. Samples collected in the lush hardwood forest yielded four salmonellae serotypes from six culturally positive samples. Out of a total of 76 samples collected at the top of the granite mountain over a three month period, 10 were positive. Only two salmonellae serotypes were isolated, and one of these was isolated only once. The detection of salmonellae was independent of the nature of the material collected and analyzed for the two sites, but the presence or absence of visible moisture had a significant effect on the recovery of salmonellae. Even a harsh environment can serve as an ecological niche for the survival and trasmission of salmonellae. (Pinto-FIRL)
W76-05100

THE MOLECULAR WEIGHT DISTRIBUTION OF SOLUBLE ORGANICS IN SEWAGE AND SEWAGE EFFLUENTS USING GEL FILTRATION,
Rutgers - The State Univ., New Brunswick, N. J.
For primary bibliographic entry see Field 5D.
W76-05101

REMOVAL OF TRACE LEVELS OF 2-ACETYLAMINOFLUORENE (2-AAF) FROM WASTEWATER,
National Center for Toxicological Research, Jefferson, Ark.
For primary bibliographic entry see Field 5D.
W76-05117

PUBLIC GROUNDWATER SUPPLIES IN CHAMPAIGN COUNTY,
Illinois State Water Survey, Urbana.
For primary bibliographic entry see Field 4B.
W76-05130

PUBLIC GROUNDWATER SUPPLIES IN CALHOUN COUNTY,
Illinois State Water Survey, Urbana.
For primary bibliographic entry see Field 4B.
W76-05131

PUBLIC GROUNDWATER SUPPLIES IN MASSAC COUNTY,
Illinois State Water Survey, Urbana.
For primary bibliographic entry see Field 4B.
W76-05132

BACKGROUND PAPERS FOR A WORKSHOP ON INPUTS, FATES, AND EFFECTS OF PETROLEUM IN THE MARINE ENVIRONMENT, VOLUME I.
National Research Council, Washington, D.C. Ocean Affairs Board.
For primary bibliographic entry see Field 5B.
W76-05135

INPUT OF PETROLEUM TO THE MARINE ENVIRONMENT DIRECTLY FROM THE ATMOSPHERE,
Engineering-Science, Inc., Berkeley, Calif.
For primary bibliographic entry see Field 5B.
W76-05138

EUROPEAN EXPERIENCE IN THE IDENTIFICATION OF WATERBORNE OIL,
Shell Research Ltd, Chester (England). Thornton Research Center.
E. R. Adlard.
In: Background Papers for a Workshop on Inputs, Fates, and Effects of Petroleum in the Marine Environment, Volume I; Ocean Affairs Board Workshop held May 21-25, 1973, Airlie, Virginia. National Academy of Sciences, Washington, D.C., p 111-133, May 1973. 3 fig, 1 tab, 27 ref.

Descriptors: *Pollutant identification, *Oil wastes, *Oil pollution, *Analytical techniques, *Europe, Chemical analysis, Water pollution, Water pollution sources, Pollutants, Chromatography, Gas chromatography, X-ray fluorescence, Neutron activation analysis, Spectroscopy, Laboratory tests, Testing procedures.

European experience in the identification of waterborne oil can be said to date from March 18, 1967, when the Torrey Canyon went aground. There had been many oil spills around the coast of the British Isles before that date, but they had been relatively small and infrequent. The two main conclusions reached in Europe since then on pollutant analysis were: (1) no single technique exists sufficient for pollutant identification and, in general, several complementary methods must be used; and (2) the exact scheme of analysis used may have to be varied from sample to sample depending on the particular circumstances of each case. A general scheme of oil pollutant analysis was described. The analysis scheme proposed uses X-ray fluorescence analysis, emission spectrometry, gas chromatography, infra-red spectroscopy, and other techniques. (See also W76-05135) (Sims - ISWS)
W76-05143

MEASUREMENT OF HYDROCARBONS IN WATER AND SEDIMENT,
Esso Research and Engineering Co., Linden, N. J. Analytical and Information Div.
R. A. Brown.
In: Background Papers for a Workshop on Inputs, Fates, and Effects of Petroleum in the Marine Environment, Volume I; Ocean Affairs Board Workshop held May 21-25, 1973, Airlie, Virginia. National Academy of Sciences, Washington, D.C., p 133a-151, May 1973. 2 tab, 35 ref.

Descriptors: *Pollutant identification, *Organic compounds, *Oil, *Chemical analysis, Analytical techniques, Water pollution, Oil pollution, Pollutants, Oceans, Water, Sediments, Measurement, Sampling, Laboratory tests, Volatility, Testing procedures.
Identifiers: *Volatile hydrocarbons, *Non-volatile hydrocarbons.

Methods to determine hydrocarbons in water and sediment were described. Techniques covered sample collection and storage and the measurement of hydrocarbons as individual compounds or as a total. An analytical method intended to measure volatile hydrocarbons will probably be unsuitable for nonvolatiles and vice versa. Thus, more than one procedure is required to measure the whole range of crude oil hydrocarbons in a given sample. Just as a single method may not handle both volatile and nonvolatile hydrocarbons, neither will a single method usually handle the complete range of concentration that is encountered in practice. It is more difficult to measure inordinately small quantities, for example. (See also W76-05135) (Sims-ISWS(
W76-05144

METHODS FOR POLYNUCLEAR AROMATIC
Esso Research and Engineering Co., Linden, N. J. Analytical and Information Div.
R. A. Brown.
In: Background Papers for a Workshop on Inputs, Fates, and Effects of Petroleum in the Marine Environment, Volume I; Ocean Affairs Board Workshop held May 21-25, 1973, Airlie, Virginia. National Academy of Sciences, Washington, D.C., p 151a-157, May 1973. 2 tab, 13 ref.

Descriptors: *Pollutant identification, *Organic compounds, *Oil, *Analytical techniques, Chemical analysis, Pollutants, Laboratory tests, Testing procedures, Measurement, Gas chromatography, U ltraviolet radiation, Oil pollution, Water pollution, Marine animals.
Identifiers: *Polynuclear aromatic hydrocarbons.

The 1950's saw the initial major effort occur on the development of methods to identify and measure polynuclear aromatic (PNA) hydrocarbons. Principal attention was directed at air particulates, tobacco smoke, and tar. Benzo(a)pyrene received major attention and still does. By the mid-1960's many papers had appeared on methods of analysis. Petroleum has received relatively little attention in comparison with cigarette smoke and air particulates. Petroleum products of early interest include mineral oils used in food processing and wax used in food packaging. The safe use of these materials has been demonstrated by showing the essential absence of PNAs. Some recent research problems have required simpler and faster methods based on gas chromatography. Almost directly applicable to petroleum is a method for measuring PNAs in coke overn efluents. This procedure, called the GC/UV method, was improved upon to handle tar from auto exhaust gas, gasoline, and used crankcase oil. In practice, a sample is tagged with C14 benz(a)anthracene and benzo(a)pyrene, treated with aqueous caustic and chromatographed on partially deactivated alumina. A portion of the resulting PNA concentrate is injected into a gas chromatograph and individual peaks are trapped. The amounts of PNAs in the trapped fractions are measured by UV absorption spectrophotometry. (See also W76-05135) (Sims - ISWS)
W76-05145

QUALITY OF WELL-WATERS OF NORTHERN MADHYA PRADESH,
College of Agriculture, Parbhani (India).
For primary bibliographic entry see Field 4B.
W76-05146

THE QUANTITATIVE DETERMINATION OF TRACE CONCENTRATIONS OF PETROLEUM-DERIVED POLLUTANTS IN THE OCEAN,
Bedford Inst. of Oceanography, Dartmouth (Nova Scotia). Atlantic Oceanographic Lab.
E. M. Levy.
In: Background Papers for a Workshop on Inputs, Fates, and Effects of Petroleum in the Marine Environment, Volume I; Ocean Affairs Board Workshop held May 21-25, 1973, Airlie, Virginia. National Academy of Sciences, Washington, D.C., p 192-223, May 1973. 24 ref, 1 append.

Descriptors: *Pollutant identification, *Oil, *Chemical analysis, *Oceans, Analytical techniques, Oily water, Oil pollution, Pollutants, Ultraviolet radiation, Infrared radiation, Spectrophotometry, Gas chromatography, Sampling, Laboratory tests, Testing procedures.
Identifiers: Tar balls.

The problem of determining trace concentrations of petroleum pollutants that are dissolved and/or dispersed through the water column and floating as particles on the surface of the ocean was

discussed. Techniques for sampling and extraction were outlined briefly while the advantages and limitations of gravimetric procedures; ultraviolet absorption, ultraviolet fluorescence, and infrared absorption spectrophotometry; and elemental analyses and gas chromatography for the quantification of the low levels that are present in the open ocean were discussed in some detail. Existing information concerning the distribution of petroleum pollutants in the open ocean were reviewed. (See also W76-05135) (Sims-ISWS)
W76-05147

PARTITIONING OF HYDROCARBONS BETWEEN THE ATMOSPHERE AND NATURAL WATERS,
Chevron Oil Field Research Co., La Habra, Calif.
For primary bibliographic entry see Field 5B.
W76-05149

IDENTIFICATION OF WATERBORNE OILS,
Shell Development Co., Houston, Tex. Bellaire Research Center.
F. T. Weiss.
In: Background Papers for a Workshop on Inputs, Fates, and Effects of Petroleum in the Marine Environment, Volume I; Ocean Affairs Board Workshop held May 21-25, 1973, Airlie, Virginia. National Academy of Sciences, Washington, D.C., p 290a-306, May 1973. 1 fig, 1 tab, 32 ref.

Descriptors: *Pollutant identification, *Oil spills, *Chemical analysis, *Analytical techniques, Oil, Oil pollution, Oily water, Pollutants, Chemistry, Sampling, Testing procedures, Laboratory tests, Gas chromatography, Spectroscopy, Weathering, Trace elements.

This review was prepared to consider and compare the principal techniques for the identification of waterborne oils, based largely on experience in the United States. A tabular summary was included to indicate the significance of the important features of each of the techniques. Some material was also presented on the important and practical aspects of sample collecting, preservation, and treatment prior to actual analysis. (See also W76-05135) (Sims-ISWS)
W76-05150

COMPLEXES AFFECTING THE SOLUBILITY OF CALCIUM CARBONATE IN WATER - PHASE II,
Illinois State Water Survey, Urbana.
For primary bibliographic entry see Field 8G.
W76-05180

NUTRIENT DYNAMICS AND GAS PRODUCTION IN AQUATIC ECOSYSTEMS: THE EFFECTS AND UTILIZATION OF MERCURY AND NITROGEN IN SEDIMENT-WATER MICROCOSMS,
Utah Center for Water Resources Research, Logan.
For primary bibliographic entry see Field 5C.
W76-05246

RESIDUE-REMOVAL METHODS FOR PESTICIDES AND INDUSTRIAL CHEMICALS FOUND IN AQUATIC ENVIRONMENTS,
Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Biochemistry and Nutrition.
R. W. Young, O. D. Parr, and J. K. Dickinson.
Available from the National Technical Information Service, Springfield, Va 22161, as PB-250 747, $3.50 in paper copy, $2.25 in microfiche. Virginia Water Resources Research Center, Blacksburg, VWRRC Bulletin 90, December 1975. 20 p, 2 tab, 5 charts, 11 ref. OWRT A-057-VA(1).

Descriptors: *Polychlorinated biphenyls, *Chlorinated hydrocarbon pesticides, Chromatography, *Pesticide residues, Gas chromatography, Aroclors, Separation techniques, Analytical techniques, *Pollutant identification, Chemicals, Carbamate pesticides.
Identifiers: *Carbamate silylation, Chlorophacinone.

This research evaluated various methods that have been advanced for separation of polychlorobiphenyls from chlorinated pesticides, to see which were effective in detecting and removing these residues often present in the aquatic environment. Preliminary investigations also were made of a new approach, the silylation of carbamates. Finally, a gas chromatographic (GLC) procedure for chlorophacinone (CPN) was developed by brominating the parent compound.
W76-05249

NATURALLY OCCURRING ORGANIC COMPOUNDS AND ALGAL GROWTH IN A EUTROPHIC LAKE,
Utah Center for Water Resources Research, Logan.
For primary bibliographic entry see Field 5C.
W76-05253

STRATEGY OF BIOLOGICAL MONITORING, (IN RUSSIAN),
V. D. Fedorov.
Biol Nauki. 17(10): 7-17, 1974.

Descriptors: *Bioindicators, *Monitoring, Ecology, *Environmental effects, Water pollution effects, Data collections, *Pollutant identification, Environmental control.

Biological monitoring is a system of long-term observations of environmental changes with respect to a number of indices established by a program. The problem of monitoring, monitoring systems and problems of strategy are examined. Monitoring for pollution and biospheric changes which could be harmful to humans and the ecological aspects of pollution are discussed.--Copyright 1975, Biological Abstracts, Inc.
W76-05301

METHOD AND MEANS FOR MONITORING THE QUANTITY OF DISPERSED OIL IN WATER,
F. B. Rosso, and R. H. Ross.
Canadian Patent 960,060. Issued December 31, 1974. The Patent Office Record, Vol. 103, No. 53, p 14, December, 1974.

Descriptors: *Industrial wastes, *Patents, Oils, Oily water, Emulsions, *Monitoring, Measurement, Ultraviolet radiation, Analytical techniques, *Pollutant identification.

The patented method and means for monitoring the quantity of dispersed oil in water is described. The system includes a source of ultraviolet light for transmission of light through a sample of the oily water, a chamber for containing the sample of liquid being analyzed, a photocell for translating ultraviolet light transmitted through the sample into an electrical signal, circuit and registration means for compensating and utilizing the signal, and a reciprocating wiper for maintaining the interior walls of the sample chamber in a clean, and suitably ultraviolet-transparent condition. The reciprocating wiper is a piston with conduits within it for introducing oil solvent to the walls of the chamber to facilitate the removal of oil resources. The output of the source of ultraviolet light is stabilized by a circuit provided. (Orr-FIRL)
W76-05338

HYGIENIC ASSESSMENT OF CERTAIN SURFACE-ACTIVE SUBSTANCES-THE COMPONENTS OF EFFLUENTS FROM TEXTILE INDUSTRY ENTERPRISES (GIGIYENICHESKAYA OTSENKA NEKOTORYKH POVERKHNOST-NOAKTIVNYKH VESHCHESTV-KOMPNENTOV STOCHNYKH VOD PREDPRIYATIY TEKSTIL'NOY PROMYSHLENNOSTI),
E. A. Kordysh, and M. M. Ratpan.
Gigiyena i Sanitariya, No. 10, p 16-20, 1974.

Descriptors: Waste water treatment, *Industrial wastes, *Textiles, Toxicity, Bioassay, Lethal limit, Pulp wastes, Pollutant identification.
Identifiers: Maximum allowable concentrations.

The complex sanitary-toxicological assessment of four components of effluents from textile mills (stearox-6, 0C-20 (non-ionogenic surface-active substances), alkamon 0C-2, and thee smoothing compound A (cation-active complexes) is presented. With respect to the effect on the self-purification of water bodies as a hygienic criterion, the maximum allowable concentrations were determined to be one mg/liter for alkamon 0C-2 and the smoothing compound A, and 5 mg/liter for 0C-20 and stearox-6. The LD50 values were determined to be in a range of 1,320-2,400 mg/kg for mice, and in a range of 3,100-5,900 mg/kg for rats, however, stearox-6 was practically non-toxic. The noeffect levels were found to 0.5 mg/kg for 0C-2, one mg/kg for the smoothing compound A, and 15 mg/kg for 0C-20. In water bodies, their limiting property was determined to be the formation of foam. Based on this criteria, the maximum allowable concentrations of 0C-20, alkamon 0C-2, the smoothing compound A, and stearox-6 have been established at 0.1; 0.5; 1; and 0.3 mg/liter, respectively. (Takacs-FIRL)
W76-05342

CHEMICAL QUALITY AND TEMPERATURE OF WATER IN FLAMING GORGE RESERVOIR, WYOMING AND UTAH, AND THE EFFECT ON THE RESERVOIR ON THE GREEN RIVER,
Geological Survey, Salt Lake City, Utah.
For primary bibliographic entry see Field 2H.
W76-05417

WATER RESOURCES OF BASINS FOR MINOR STREAMS DRAINING INTO ST. CLAIR RIVER, LAKE ST. CLAIR, DETROIT RIVER, AND LAKE ERIE, SOUTHEASTERN MICHIGAN,
Geological Survey, Lansing, Mich.
For primary bibliographic entry see Field 7C.
W76-05427

WATER RESOURCES OF THE MISSISSIPPI AND SAUK RIVERS WATERSHED, CENTRAL MINNESOTA,
Geological Survey, St. Paul, Minn.
For primary bibliographic entry see Field 7C.
W76-05428

WATER RESOURCES OF THE HURON RIVER BASIN, SOUTHEASTERN MICHIGAN,
Geological Survey, Grayling, Mich.
For primary bibliographic entry see Field 7C.
W76-05429

DISTRIBUTION OF DIFFERENT QUALITIES OF UNDERGROUND WATERS IN REWARI TEHSIL OF HARYANA STATE,
Haryana Agricultural Univ., Hissar (India).
For primary bibliographic entry see Field 3C.
W76-05432

IDENTIFICATION OF GAMMA-VALEROLACTONE IN WASTE WATER FROM AN OIL-SHALE IN SITU RETORT,
Bureau of Mines, Laramie, Wyo. Laramie Energy Research Center.
F. R. McDonald.
Report of Investigations 7918, 1974. 10 p. 5 fig, 1 tab, 10 ref.

Descriptors: *Oil shales, *Geochemistry, *Analytical techniques, *Wyoming, Gas chromatography, Infrared radiation, Nuclear magnetic resonance, Mass spectrometry, Molecular structure, *Pollutant identification.
Identifiers: *Valerolactone, *Oil-shale retorts, Laramie(Wyo), Green River.

Waste water recovered from the retorting of oil shale in Laramie, Wyoming, contained dissolved process materials. These were analyzed to see what materials were present in order to determine if there were any useful components which could be economically recover ed. The compound gamma-valerolactone (valeric acid, 4-hydroxy-gamma-lactone) was identified in an acid fraction subjected to countercurrent extraction and separated by gas chromatography. Because of the small quantities of material present, infrared spectroscopy, nuclear magnetic resonance, and mass spectrometry were used to identify the isolated material. The combined spectral information indicated the presence of a molecule containing carbon, hydrogen, and oxygen with a molecular weight of 100. Infrared spectra indicated a saturated cyclic-type structure with at least one carbonyl-type function in a position indicative of a lactone having a five membered ring, no unsaturation, and no long chains. Mass spectral data indicated one double bond, one ring, and five carbons. The empirical formula was corroborated by nuclear magnetic resonance area resonances. Its detection and identification could be significant in geochemical studies of the origin of Green River oil shale. (Buchanan-Davidson--Wisconsin).
W76-05448

ANALYSIS OF SULFUR-CONTAINING PRODUCTS ACCUMULATED BY CHLORELLA MUTANTS,
Leningrad State Univ. (USSR). Inst. of Nuclear Physics.
For primary bibliographic entry see Field 5C.
W76-05476

5B. Sources Of Pollution

NUMERICAL SIMULATION OF SALT-WATER INTRUSION IN COASTAL AQUIFERS, PART 1,
Princeton Univ., N. J. Dept. of Geological and Geophysical Sciences.
G. F. Pinder.
Available from the National Technical Information Service, Springfield, Va. 22161, as PB-250 127, $4.50 in paper copy, $2.25 in microfiche. Water Resources Program, Report WRP-75-2, 1975. 50 p. OWRT C-5224(No. 4214)(2).

Descriptors: *Simulation analysis, Aquifers, Model studies, *Groundwater movement, *Mathematical models, *Saline water intrusion, Water quality, Saline water-freshwater interfaces, *Finite element analysis, *Computer models, Systems analysis, Numerical analysis, Equations, Mathematical studies, Coastal plains, *Florida, Mass transfer, *Computer programs.
Identifiers: Cutler area(Fla), Aquifer models, Transport phenomena, *Coastal aquifers.

The set of non-linear partial differential equations which describe the movement of the saltwater front in a coastal aquifer is solved by the Galerkin-finite element method. Pressure and velocities are obtained simultaneously in order to guarantee continuity of velocities between elements. A layered aquifer is modeled either with a functional representation of permeability or by a constant value of permeability over each element. The Galerkin-finite element method is subsequently used to simulate the two-dimensional movement of the saltwater front in the Cutler area of the Biscayne aquifer near Miami, Florida. The concentration distributions for steady state and transient conditions are obtained using pressure head data measured in the field formulating boundary conditions. (See also W76-05011)
W76-05010

NUMERICAL SIMULATION OF SALT-WATER INTRUSION IN COASTAL AQUIFERS, PART 2,
Princeton Univ., N. J. Dept of Geophysical Sciences.
G. Segol, G. F. Pinder, and W. G. Gray.
Available from the National Technical Information Service, Springfield, Va. 22161, as PB-250 128 $7.75 in paper copy, $2.25 in microfiche copy. Water Resources Program, Report WRP-75-2, 1975. 119 p. OWRT C-5224(No. 4214)(2).

Descriptors: *Simulation analysis, Aquifers, Model studies, *Groundwater movement, *Mathematical models, *Saline water intrusion, Water quality, Saline water-freshwater interfaces, *Finite element analysis, *Computer models, Systems analysis, Numerical analysis, Equations, Mathematical studies, Coastal plains, *Florida, Mass transfer, *Computer programs.
Identifiers: Cutler area(Fla), Aquifer models, Transport phenomena, *Coastal aquifers.

The computer program developed is intended to solve the two-dimensional equations of groundwater flow and mass transport using the Galekinfinite element method. While the program was developed to investigate saltwater intrusion in coastal aquifers by considering a cross-section of the three-dimensional space, it can also be applied by considering a cross-section of the three-dimensional space, it can also be applied to the study of areal problems. The computer code is written in FORTRAN IV for the IBM 360/91 system. The method of analysis is briefly described; and related documentation, such as FORTRAN program listings, are included. (See also W76-05010)
W76-05011

SENSITIVITY OF VERTEBRATE EMBRYOS TO HEAVY METALS AS A CRITERION OF WATER QUALITY, PHASE III, USE OF FISH AND AMPHIBIAN EGGS AND EMBRYOS AS BIOINDICATOR ORGANISMS FOR EVALUATING WATER QUALITY,
Kentucky Water Resources Research Inst., Lexington.
For primary bibliographic entry see Field 5C.
W76-05014

PHYSICOCHEMICAL TRANSFORMATIONS OF SEWAGE EFFLUENT RELEASES IN AN EPHEMERAL STREAM CHANNEL,
Arizona Univ., Tucson. Dept. of Hydrology and Water Resources.
For primary bibliographic entry see Field 5A.
W76-05018

PHOSPHORUS MOVEMENT IN SOILS: THEORETICAL ASPECTS,
Cleveland State Univ., Ohio. Dept. of Chemical Engineering.
L. T. Novak, D. C. Adraino, G. A. Coulman, and D. B. Shah.
Journal of Environmental Quality, Vol. 4, No. 1, p 93-99, January/March, 1975. 4 fig, 5 tab, 15 ref, append.

Descriptors: *Phosphorus, *Soil water movement, *Soils, Flows, Waste water treatment, Mathematical models, Adsorption, Unsteady flow, Steady flow, Saturated flow, Unsaturated flow, Water pollution control, *Path of pollutants, Water pollution sources.
Identifiers: Desorption, Steady flow phosphorus models, Transport models, Plug flow, Nonideal flow.

Phosphorus has been identified as one of the nutrients that causes eutrophication in lakes and streams. Land treatment is being considered as a method of removing P and other nutrients from waste waters. A model of P movement in soils is discussed and compared with existing transport models, developed to describe chromatographic and ion exchange processes. The background of transport models is presented. The model described in this study is an adsorption-desorption model which can handle unsteady state flow under unsaturated and saturated flow conditions. The steady flow P model was developed for the following conditions: one-dimensional system in the direction of flow; isothermal system; constant water content, bulk dry solid density and pore velocity; and nonideal flow described by a dispersion coefficient. The model equations are presented. Numerical solutions for the P model were obtained by an implicit numerical technique. Comparisons of various adsorption-desorption models under both plug flow and nonideal flow are graphically illustrated. Application of the P model to describe adsorption in soils results in a shock layer which was less than four centimeters in thickness in all cases considered. If the ratio of the adsorption rate to bulk convective transport rate is large, small shock layers result. The converse is also true. No mathematical theory has been developed to prove that desorption causes a shock layer. Numerical solutions are necessary. (Pinto-FIRL)
W76-05048

POTABLE WATER QUALITY IN RURAL GEORGETOWN COUNTY,
South Carolina State Coll., Orangeburg. Dept. of Natural Sciences.
For primary bibliographic entry see Field 5A.
W76-05050

SEASONAL OCCURRENCE AND DISTRIBUTION OF MICROBIAL INDICATORS AND PATHOGENS IN THE RHODE RIVER OF CHESAPEAKE BAY,
Maryland Univ., College Park. Dept. of Microbiology.
J. F. Carney, C. E. Carty, and R. R. Colwell.
Applied Microbiology, Vol. 30, No. 5, p 771-780, November, 1975. 3 fig, 6 tab, 19 ref.

Descriptors: Indicators, *Microorganisms, *Pathogenic bacteria, *Bacteria, *Coliforms, Streptococcus, Pollutant identification, Estuaries, Chesapeake Bay, Clostridium, Salmonella, Maryland, *Bioindicators, Path of pollutants, Distribution patterns.
Identifiers: Fecal coliforms, Fecal streptococci, Rhode River estuary (Md), Clostridium botulinum, V. parahaemolyticus.

Coliforms and fecal streptococci have been used as indicators of other pathogenic bacteria associated with fecal contamination. Increasingly heavy nutrient loads have protected microorganisms that would normally die off. Indicator organisms were evaluated as part of a larger study of the microbial ecology of the Rhode River, a small subestuary area of Chesapeake Bay. Four sampling sites were set up at various places in the estuary. Water samples were collected all year at one meter depths, and analyzed for conductivity, salinity, temperature, dissolved oxygen, and turbidity. Water samples were plated on estuarine salt-water-yeast extract agar, and incubated for 2 weeks at 15C. Standard methods of analysis were used to determine total coliform, fecal coliform, and fecal streptococci counts. Clostridium botulinum, Salmonella spp., and V. parahaemolyticus were also measured. Resultsshow that the highest frequency of occurrence of total and fecal coliforms and fecal streptococci was in Muddy Creek, a marsh area which receives most of its runoff from pasture lands. The second highest frequency of occurrence was found in Cadle Creek, which is near populated land. Lowest measurements of these organisms were obtained in the central portion of the Rhode River. Clostridium botulinum was found in about 12% of the samples. Salmonella spp. was not found in any of the samples. V. parahaemolyticus was found near populated areas in the summer months. (Pinto-FIRL)

W76-05052

INVESTIGATIONS ON THE MICROBIAL REDUCTION OF SULPHATES,
Adam Mickiewicz Univ., Poznzn (Poland). Inst. of Geography.
For primary bibliographic entry see Field 5D.
W76-05054

CRITERIA FOR THE ECOLOGICAL EVALUATION OF THE LOWER MAIN RIVER, (IN GERMAN),
Natur-Museum und Forschungs-Institut Senchkenber, Frankfurt am Main (West Germany).
W. Tobias.
Cour Forschungsinst Senckenb. 11. 1-136. 1974.

Descriptors: *Ecology, Evaluation, *Balance of nature, *Chemical wastes, Domestic wastes, *Industrial wastes, Cooling water, Thermal pollution, Water pollution sources, Aquatic life.
Identifiers: *Main River(Germany).

The Lower River Main crosses one of the most overcrowded regions of southwestern Germany. With the centralization of population and industries on its banks, the river has assumed the function of a sewage system for industrial and communal waste waters and for warmed cooling waters from power stations. The ecological balance in the River Main is greatly disturbed. The Lower River Main has 3 ecological regions: the relatively ecological stable section from Wallstadt to Aschaffenburg, the part down to Offenbach, which is extremely sensitive in its ecological balance and a 3rd section from Frankfurt to the River Rhein which has such an excess of chemical content that the macrofauna is threatened.--Copyright 1975, Biological Abstracts, Inc.
W76-05057

UNSATURATED FLOW DURING SOIL TREATMENT OF SEPTIC TANK EFFLUENT,
Soil Survey Inst., Wageningen. (Netherlands)
J. Bouma.
Journal of the Environmental Engineering Division, Proceedings of ASCE, Vol. 101, No. EE6, p 967-983, December, 1975. 2 fig, 2 tab. 41 ref. 2 app.

Descriptors: *Soil treatment, *Septic tanks, *Effluents, On-site tests, *Pathogenic bacteria, Hydraulic conductivity, Hydraulic gradient, Hydraulics, Flow, *Waste water disposal, Disposal, Liquid wastes, Domestic wastes, *Unsaturated flow, Waste disposal, *Path of pollutants, Water pollution sources.
Identifiers: Pathogenic purification, Hydraulic head.

The physical theory of unsaturated flow associated with liquid movemet through barriers is examined and some practical implications are studied. Tensiometric in-situ measurements made in soil surrounding operating seepage systems in a wide range of soils are presented and examined. Implications following from the availability of such data for design procedures of waste disposal systems are examined. Subsurface soil disposal of household liquid wastes involves processes of unsaturated flow and the potential of different soils for on-site disposal, and can be described only if hydraulic head curves are available. The effects of soil clogging or soil compaction on infiltration into seepage are a function of the barrier resistance and capillary properties of the soil. To adequately purify septic tank effluent, unsaturated flow is necessary. Data indicate that three feet of soil are required to achieve pathogenic purification, providing the soils not overloaded. The effluent must be evenly distributed over the seepage area during each application to achieve adequate purification in unclogged sands, and to avoid clogging in weak loamy soils. Construction of shallow trench seepage systems in clayey soil is recommended to avoid compaction and puddling of infiltrative surfaces. Large undisturbed soil columns must be used for laboratory studies to be useful. Columns of improper length filled with sieved aggregates have different hydraulic characteristics. Elaborate on-site testing can be reduced by using classification schemes and soil maps. (Pinto-FIRL)
W76-05058

FACTORS AFFECTING RESPIRATORY QUOTIENT--APPLICATION TO PURE OXYGEN SYSTEMS,
Manhattan Coll., Bronx, N. Y. Dept. of Environmental Engineering and Science.
For primary bibliographic entry see Field 5D.
W76-05078

A DISCUSSION OF A NEAR FIELD DISPERSION MODEL FOR SLUDGE DISCHARGES TO COASTAL WATERS,
Pacific Northwest Environmental Research Lab., Corvallis Oreg.
W. F. Rittall.
In: Research Symposium on Pretreatment and Ultimate Disposal of Wastewater Solids, May 21-22, New Brunswick, New Jersey, Rutgers University, p 435-476. 21 fig, 6 tab, 6 ref.

Descriptors: *Dispersion, *Mathematical models, *Sludge, *Sludge disposal, *Computer models, Computer programs, Sewage sludge, Sewage, Federal government, Regulations, Disposal, Ocean, Evaluation, Permits, Analysis, Dispersion, Model studies, Path of pollutants.
Identifiers: *Coastal waters, Computer simulation, Ocean disposal, Transport modes.

Computer simulation techniques can provide a detailed description of the sequence of events that occur after sludge discharge, enhancing the interpretation of physical mechanisms. The application of this simulation technique for the problem of sewage sludge discharges is demonstrated. The depth of penetration of the waste cloud, the dilution, and the depositional characteristics of settleable and floating solids are discussed and related to pertinent Federal Regulations governing ocean dumping. Three separate methods of discharge are described by the model: instantaneous, pumped and wake releases. One liquid and a maximum of eight distinct solid or particulate phases can be chosen from to characterize the waste. Three transport modes are long term diffusion, collapse, and convective descent. Results were evaluated in terms of predictive capabilities and applications to the general problem of permit evaluation, site monitoring surveys, and compliance with regulatory criteria. It is hoped that this model can be of significant value since there is no other procedure or model available to the regulatory programs which provides such a detailed degree of analysis. (See also W76-05079) (Pinto-FIRL)
W76-05089

RATES AND MECHANISMS OF CHEMICAL REACTIONS DURING FLOW OF SECONDARY TREATED SEWAGE EFFLUENT THROUGH POROUS BEDS,
California Inst. of Tech., Pasadena.
For primary bibliographic entry see Field 5D.
W76-05103

THE ENERGY FLOW THROUGH A LOTIC ECOSYSTEM, (IN SWEDISH),
Umea Univ. (Sweden). Dept. of Biology; and Umea Univ. (Sweden). Dept. of Ecological Zoology.
U. Karlstrom.
Zool Revy. 35(3): 109-114. 1973.

Descriptors: *Ecosystems, *Lotic environment, Energy, *Food chains, Detritus, Flow, *Flow regulation, Phytoplankton, Zooplankton, Reviews.
Identifiers: *Energy flow.

Structure and function of a lotic ecosystem are discussed, with emphasis on the detritus food chain. The ecosystem can be described in the following terms: driving forces, components or structure, energy flow and regulating mechanisms of the flow. The different conditions of a brook and a river and their ecological impact on the phyto- and zoo-communities are discussed. A short review of literature concerning the 1st works on ecosystem studies and energy flows is given.--Copyright 1975, Biological Abstracts, Inc.
W76-05124

CORROSION IN DISPOSAL WELLS,
Subsurface Disposal Corp., Houston, Tex.
For primary bibliographic entry see Field 5E.
W76-05125

EXPANSION OF SALT-WATER ZONE DUE TO WELL DISCHARGE,
North Carolina State Univ., Raleigh. Dept. of Civil Engineering.
For primary bibliographic entry see Field 2L.
W76-05133

BACKGROUND PAPERS FOR A WORKSHOP ON INPUTS, FATES, AND EFFECTS OF PETROLEUM IN THE MARINE ENVIRONMENT, VOLUME I.
National Research Council, Washington, D.C. Ocean Affairs Board.
Workshop held May 21-25, 1973, Airlie, Virginia. May 1973. 374 p. NSF N00014-67-A-0244-0028.

Descriptors: *Path of pollutants, *Oceans, *Water pollution sources, *Conferences, *Oil, Oil spills, Oil pollution, Oily water, Oil wastes, Analytical techniques, Chemical analysis, Measurement, Pollutant identification, Biodegradation, Environment, Environmental effects, Aquatic environment, Water pollution effects, Bioindicators, Water analysis.

Subject areas covered in background papers included: (1) input sources of petroleum to the marine environment; (2) chemical techniques for identification of waterborne oil, determination of trace concentrations of petroleum-derived pollutants in the ocean, determination of petroleum contamination in marine organisms, and analysis of the environmental impact of an offshore oil spill; and (3) biological techniques for studying effects of marine oil spills, evaluation of biological damage, and hydrocarbon biodegradation kinetics. (See W76-05136 thru W76-05153) (Humphreys-ISWS)
W76-05135

THE SOURCES OF OIL ENTERING THE SEA,
British Petroleum Trading, Ltd., London (England).
K. G. Brummage.
In: Background Papers for a Workshop on Inputs, Fates, and Effects of Petroleum in the Marine Environment, Volume I; Ocean Affairs Board Workshop held May 21-25, 1973, Airlie, Virginia. National Academy of Sciences, Washington, D. C., p 1-6, May 1973. 11 ref.

Descriptors: *Oil pollution, *Oil wastes, *Water pollution sources, Ships, Accidents, Oil spills, Oily water, Water pollution, Oil industry, Oil, Fuels, Effluents, Path of pollutants.

The main sources of oil entering the sea were reviewed. These sources included tanker cargo operations, tanker accidents, accidents of other ships, offshore oil operations, refineries, discharges on land, and bilges, bunkering, etc. The total amount of oil entering the sea was estimated to be 7.55 million tons per annum. About 39% of this is due to tanker operations. (See also W76-05135) (Sims - ISWS)
W76-05136

QUANTITATIVE ESTIMATES OF PETROLEUM TO THE OCEANS
Coast Guard, Washington, D. C.
D. B. Charter, R. A. Sutherland, and J. D. Porricelli.
In: Background Papers for a Workshop on Inputs, Fates, and Effects of Petroleum in the Marine Environment, Volume I; Ocean Affairs Board Workshop held May 21-25, 1973, Airlie, Virginia. National Academy of Sciences, Washington, D. C., p 6a-30, May 1973. 1 fig, 7 tab, 7 ref.

Descriptors: *Oil pollution, *Oceans, *Water pollution sources, Oil wastes, Oil spills, Oily water, Ships, Accidents, Oil industry, Oil, Estimating, Water poilution, Path of pollutants.

The need for an overall view of oil pollution of the sea has led to a number of estimates of the annual amount of oil discharged into the marine environment. These estimates surprisingly do not differ from one another in the overall totals given, although the contribution attributed to various sources within that total differs widely. Some contributions are known with a fair degree of accuracy; others can only be said to represent a 'best estimate' . The estimates of ten of the more important sources of information on this topic were tabulated. The sources of oil were broken down into four major categories: (1) tank cleaning and ballasting operations by tankers, (2) other tanker all other vessel operations including terminal operations, (3) ship accidents, and (4) non-ship sources. The total for these sources is estimated to be about 3.5 million metric tons per annum. (See also W76-05135) (Sims - ISWS)
W76-05137

INPUT OF PETROLEUM TO THE MARINE ENVIRONMENT DIRECTLY FROM THE ATMOSPHERE,
Engineering-Science, Inc., Berkeley, Calif.
D. L. Feuerstein.
In: Background Papers for a Workshop on Inputs, Fates, and Effects of Petroleum in the Marine Environment, Volume I; Ocean Affairs Board Workshop held May 21-25, 1973, Airlie, Virginia. National Academy of Sciences, Washington, D. C., p 30a-38, May 1973. 2 tab, 9 ref.

Descriptors: *Oil pollution, Organic compounds, Oil wastes, Water pollution, *Path of pollutants, Water pollution sources, Oil, Transportation, Rainfall, Precipitation(Atmospheric).

The category 'hydrocarbons' is not limited to petroleum or petroleum-derived products but contains many other carbon-and hydrogen-containing compounds. For the purpose of this discussion, only 'hydrocarbons' emanatingfrom the following sources are considered as 'petroleum': transportation, combustion of fuel oil from stationary sources, industrial processes, organic solvent evaporation and gasoline marketing. These sources amount for a total of 23.6 million metric tons per annum or 81% of the total hydrocarbon emission to the atmosphere from the United States. Total worldwide emission of petroleum hydrocarbons is estimated to be 68 million metric tons per annum, of which transportation comprises approximately two-thirds. The total amount of petroleum hydrocarbons reaching the oceans via the atmosphere is estimated to be approximately 0.4 to 0.8 million metric tons per annum as compared to 2 to 3 million metric tons per annum from other sources such as tanker operations, accidental spills, terminal and transfer operations, off-shore oil production and so forth (See also W76-05135) (Sims-ISWS)
W76-05138

SURVEY OF PRESENT KNOWLEDGE AND DISCUSSION OF INPUT OF PETROLEUM TO THE MARINE ENVIRONMENT IN SWEDEN,
Swedish Water and Air Pollution Research Lab., Goteborg (Sweden).
A. Hallhagen.
In: Background Papers for a Workshop on Inputs, Fates, and Effects of Petroleum in the Marine Environment, Volume 1; Ocean Affairs Board Workshop held May 21-25, 1973, Airlie, Virginia. National Academy of Sciences, Washington, D. C., p 38a-49, May 1973. 6 tab, 4 ref.

Descriptors: *Oil wastes, *Oil pollution, *Oceans, *Water pollution sources, Oil, Oil spills, Transportation, *Path of pollutants, Chemical analysis, Organic compounds, Atmosphere, Precipitation(Atmospheric), Water pollution.
Identifiers: *Sweden.

In Sweden roughly 30.5 million cu m of petroleum products was consumed during 1972, corresponding to 3.75 cu m/person. Since Sweden has no petroleum wells within its borderlines all consumption is based upon imports. It was calculated, through comparison between delivered and consumed quantities, etc., that the total loss, spill and evaporation of petroleum products in Sweden, except unburned hydrocarbons in the exhaust gases from burning processes, amount to roughly 0.5 - 0.7% of the total consumption, or 150,000 - 200,000 cu m/year. In addition to this, major amounts of hydrocarbons reach the atmosphere from all kinds of burning processes. This quantity was estimated to be somewhere around 300,000 cu m/year. A satisfactory explanation to how much of Sweden's estimated loss of petroleum products gains access to the environment cannot be given at present. Roughly 25% of the total estimated loss, except unburned hydrocarbons, could be considered fairly well traced. Possible explanations to the remaining part would be: (1) evaporation to atmosphere of hydrocarbons from other sources than refineries, and (2) oil spill collected in industry and elsewhere being burned as fuel oil. (See also W76-05135) (Sims - ISWS)
W76-05139

PETROLEUM INPUTS TO THE MARINE ENVIRONMENT FROM LAND SOURCES,
Engineering-Science, Inc., Berkeley, Calif
P. N. Storrs.
In: Background Papers for Workshop on Inputs, Fates, and Effects of Petroleum in the Marine Environment, Volume I; Ocean Affairs Board Workshop held May 21-25, 1973, Airlie, Virginia. National Academy of Sciences, Washington, D. C., p 49a-58, May 1973. 2 tab, 9 ref.

Descriptors: *Oil wastes, *Oil pollution, *Oceans, Water pollution, *Water pollution sources, *Path of pollutants, Oil, Domestic wastes, Industrial wastes, Land, Estimating, Oil industry, Urban runoff, Urban drainage.

Relatively little attention has been given to the inputs of petroleum based materials from land sources. This paper is concerned with estimating the quantities of petroleum materials entering the coastal waters from municipal and industrial wastewaters, urban storm drainage, and surface water discharges. One of the problems encountered immediately are facts that almost none of the data in the literature concerning the characterization of waters and wastewaters has been collected with the objective of measuring petroleum. In standard sanitary engineering practice, measurements of a lumped parameter, oil and grease, are routinely made of waters and wastewaters. The total municipal input of petroleum to the ocean may be estimated by assuming a unit input of 8 g/cap-day and 68 million persons living in coastal areas to obtain a nationwide estimate of about 200,000 metric tons per year. The major industrial input of petroleum is from refineries and oil production facilities. Assuming a total United States refinery capacity of 5 x 10 to the 9th power bbls/yr, and a unit mass emission rate of 5 metric tons/million bbls, the total national input from refineries would be about 25,000 metric tons/yr. Again assuming that the world production capacity is about 2 x 10 to the 9th power metric tons or about 15 x 10 to the 9th power bbls/yr, one would obtain a worldwide total of 75,000 metric tons/yr from refineries. (See also W76-05135) (Sims - ISWS)
W76-05140

ESTIMATE OF ANNUAL INPUT OF PETROLEUM TO THE MARINE ENVIRONMENT FROM NATURAL MARINE SEEPAGE,
Exxon Production Research Co., Houston, Tex. Geologic Research.
R. D. Wilson.
In: Background Papers for a Workshop on Inputs, Fates, and Effects of Petroleum in the Marine Environment, Volume I; Ocean Affairs Board Workshop held May 21-25, 1973, Airlie, Virginia. National Academy of Sciences, Washington, D.C., p 58a-96, May 1973. 6 fig, 8 tab, 24 ref.

Descriptors: *Seepage, *Oil, *Oceans, *Oil pollution, Path of pollutants, Water pollution, Water pollution sources, Oil wastes, Geology, *Estimating, Faults(Geologic), Earthquakes.
Identifiers: *Marine oil seepage.

A portion of the oil now present in the world's ocean results from the direct discharge of submarine seeps into the water. Although only a very few marine oil seeps are presently known and located, all evidence suggests that with further investigation, many more will be found. Few seepage flow rate observations are available either for offshore or onshore seeps. In view of the limited observations, only a few cursory estimates of total worldwide annual marine seepage have been made; there appears to be no substantiation for any of these estimates. This paper, which is based on geologic considerations, presented an estimate of yearly oil input into the oceans from naturally occurring marine seepage. The probable range of seepage into the marine environment is 0.2 to 6.0 million metric tons per year. Within this range the best estimate for present marine seepage worldwide is 0.6 million metric tons per year. This is based on the presumption that only a few other areas around the world are as seepage-prone as Southern California. Measurements of seeps and seepage rates are too few to allow an accurate estimation by observation and measurement techniques alone. Seepage potential can, however, be related to geologic criteria, and these provide sound bases for marine seepage assessme nt. (See also W76-05135) (Sims-ISW)
W76-05141

ESTIMATES OF ANNUAL INPUT OF PETROLEUM TO THE MARINE ENVIRONMENT FROM OFFSHORE PRODUCTION OPERATIONS,
Exxon Production Research Co., Houston, Tex. Geologic Research.
R. D. Wilson.
In: Background Papers for a Workshop on Inputs, Fates, and Effects of Petroleum in the Marine Environment, Volume I; Ocean Affairs Board Workshop held May 21-25, 1973, Airlie, Virginia. National Academy of Sciences, Washington, D.C., p 96a-110, May 1973. 3 tab, 6 ref, 1 append.

Descriptors: *Oil spills, *Oil pollution, *Oil wells, *Oceans, *Gulf of Mexico, *Offshore platforms, Water pollution, Water pollution sources, Oil industry, Accidents, Pollutants, Path of pollutants, Brines, Oil fields, *Estimating.

It is estimated that the amount of oil entering the sea from minor spills and produced brines during the normal drilling and operation of offshore oil and gas wells worldwide is 0.02 million metric tons per year. In addition, losses due to major accidents are not expected to exceed the average loss experience of recent years. Extrapolating the available data from United States operations in the Gulf of Mexico from 1964-1971 suggests that loss to the sea from major accidents wells or production facilities might reach 0.06 million metric tons per year. Thus, total input of oil to the sea from

offshore drilling and production operations is estimated at 0.08 million metric tons per year worldwide. (See also W76-05135) (Sims - ISWS)
W76-05142

EUROPEAN EXPERIENCE IN THE IDENTIFICATION OF WATERBORNE OIL,
Shell Research Ltd, Chester (England). Thornton Research Center.
For primary bibliographic entry see Field 5A.
W76-05143

MEASUREMENT OF HYDROCARBONS IN WATER AND SEDIMENT,
Esso Research and Engineering Co., Linden, N. J. Analytical and Information Div.
For primary bibliographic entry see Field 5A.
W76-05144

METHODS FOR POLYNUCLEAR AROMATIC
Esso Research and Engineering Co., Linden, N. J. Analytical and Information Div.
For primary bibliographic entry see Field 5A.
W76-05145

THE QUANTITATIVE DETERMINATION OF TRACE CONCENTRATIONS OF PETROLEUM-DERIVED POLLUTANTS IN THE OCEAN,
Bedford Inst. of Oceanography, Dartmouth (Nova Scotia). Atlantic Oceanographic Lab.
For primary bibliographic entry see Field 5A.
W76-05147

THE ENVIRONMENTAL IMPACT OF AN OFFSHORE OIL SPILL,
Chevron Oil Field Research Co., La Habra, Calif.
For primary bibliographic entry see Field 5C.
W76-05148

PARTITIONING OF HYDROCARBONS BETWEEN THE ATMOSPHERE AND NATURAL WATERS,
Chevron Oil Field Research Co., La Habra, Calif.
C. D. McAuliffe.
In: Background Papers for a Workshop on Inputs, Fates, and Effects of Petroleum in the Marine Environment, Volume I; Ocean Affairs Board Workshop held May 21-25, 1973, Airlie, Virginia. National Academy of Sciences, Washington, D.C., p 279a-290, May 1973. 1 tab, 15 ref.

Descriptors: *Oil pollution, *Oceans, *Evaporation, Oily water, Water pollution, Atmosphere, Surface waters, Air, Oil, Oil spills, Chemistry, Methane, *Path of pollutants.

When oil is discharged onto a water surface, the lower-molecular-weight hydrocarbons with up to at least 12 to 15 carbon atoms in the molecule evaporate into the atmosphere. Atmospheric loss of individual hydrocarbons becomes proportionately less as their molecular weight increases or water temperatures decrease. The amount of evaporative loss depends also upon the type of oil. Portions of the lower-moleculor-weight hydrocarbons also dissolve in waters. Following solution in water, most of the dissolved hydrocarbons probably partition into the atmosphere rather quickly under wind, current, and wave action. It has been postulated that up to 90 million tons of volatile petroleum hydrocarbons, chiefly from land sources, are added to the atmosphere each year. This paper discussed the predicted distribution of hydrocarbons between the atmosphere and waters, the relative volume of the atmosphere and the oceans, and the observed partitioning of methane between the atmosphere and oceans. (See also W76-05135) (Sims-ISWS)
W76-05149

IDENTIFICATION OF WATERBORNE OILS,
Shell Development Co., Houston, Tex. Bellaire Research Center.
For primary bibliographic entry see Field 5A.
W76-05150

HYDROCARBON BIODEGRADATION KINETICS,
Alaska Univ., College. Inst. of Marine Science.
D. Button.
In: Background Papers for a Workshop on Inputs, Fates, and Effects of Petroleum in the Marine Environment, Volume I; Ocean Affairs Board Workshop held May 21-25, 1973, Airlie, Virginia. National Academy of Sciences, Washington, D.C., p 306a-322, May 1973.

Descriptors: *Oil spills, *Biodegradation, *Metabolism, *Oceans, Path of pollutants, Microbial degradation, Oil pollution, Degradation(Decomposition), Aquatic microbiology, Microbiology, Marine microorganisms, Bacteria, Fungi, Laboratory tests, On-site investigations.

Microbial metabolism, eventually to carbon dioxide, is the final fate of spilled oil except for portions somehow preserved. Response in water chemistry to oil spilled can be considered as the result of a single impulse and subsequent relaxation back to the original equilibrium. Catalysts setting the rate and extent of the reactions are enzymes. Taken collectively this is the population of hydrocarbon oxidizing organisms, chiefly bacteria and fungi. It is these populations that would directly respond to spilled oil. Decay rates, along with the reciprocal changes in heterotrophic populations, depend on a number of largely unmeasured rate constants. However limited observations of in situ radioactive hydrocarbon oxidation rates suggest that hydrocarbon oxidation occurs with rather surprising speed in the marine environment. (See also W76-05135) (Sims-ISWS)
W76-05151

METHODS FOR STUDYING THE EFFECTS OF MARINE OIL SPILLS,
Woods Hole Oceanographic Inst. Mass.
For primary bibliographic entry see Field 5C.
W76-05152

ANALYTICAL APPROACH IN THE EVALUATION OF BIOLOGICAL DAMAGE RESULTING FROM SPILLED OIL,
Consortium of Universities for Water Research, Montreal (Quebec).
For primary bibliographic entry see Field 5C.
W76-05153

MATHEMATICAL MODELS PREDICT CONCENTRATION-TIME PROFILES RESULTING FROM CHEMICAL SPILL IN A RIVER,
Dow Chemical U. S. A., Midland, Mich. Health and Environmental Research.
W. B. Neely, G. E. Blau, and T. Alfrey, Jr.
Environmental Science and Technology, Vol. 10, No. 1, p 72-76, January 1976. 8 fig, 2 tab, 6 ref.

Descriptors: *Mathematical models, *Flow rates, *Evaporation, *Solubility, Water pollution effects, *Path of pollutants, *Mississippi River, Density, Dispersion, River flow, Hydraulics, Mixing.
Identifiers: Infusion, Concentration time, River geometry.

With the increased use of the nation's waterways for the transportation of materials, there is an increase in the probability of spills. Once such a spill has occurred, there is an immediate need to predict the concentration profile of the chemical as the spill travels in order to assess the impact to both humans and the environment. This paper discussed the use of a mathematical model that has this predictive capability for common spills. Although the model was derived from the assumption that the chemicals are completely water soluble, it is also useful for partially soluble materials. The credibility of the model was demonstrated by comparing the concentration profile predicted with the actual profiles measured in two different incidents. The model fit the data adequately and provided a plausable explanation of chloroform spill in the Mississippi River. It demonstrates how the soluble contaminant concepts can be modified via an interactive model-building procedure to arrive at a model suitable for describing a contaminant with different physiochemical properties. (Lardner-ISWS)
W76-05155

COMPARISON OF THERMAL SCANNING AND IN SITU TECHNIQUES FOR MONITORING THERMAL DISCHARGES,
Argonne National Lab., Ill.
G. J. Marmer, J. V. Tokar, and R. P. Madding.
Water Resources Bulletin, Vol. 11, No. 6, p 1157-1180, December 1975. 15 fig, 3 ref.

Descriptors: *Remote sensing, *Infrared radiation, *Thermal pollution, *Heated water, *Path of pollutants, Nuclear powerplants, Great Lakes, *Lake Michigan, *Isotherms, Aircraft, Temperature, Water cooling, Water pollution sources, Water temperature, Lakes.
Identifiers: *Thermal plumes, Infrared scanning, Point Beach nuclear power plant(Wis), Isothermal configurations, Centerline temperature decay.

Two methods of measuring the behavior of thermal plumes were compared by application to plumes at Point Beach Nuclear Power Plant on Lake Michigan. The classical in situ method, which employs surface and subsurface thermistor probes extended from a boat whose position is determined by a microwave ranging system, was contrasted with a remote sensing technique which utilizes an aircraft-mounted infrared scanner operating in the 8-14 micron range. Principal characteristics of plume description were isothermal configurations, areas contained within isotherms, and centerline temperature decay. The in situ method was slow and subject to effects of external forces over the test period, and it required interpolative judgment to generate isotherms; but it did provide information on subsurface as well as surface temperatures. Thermal scanning produced a considerably more detailed picture of surface temperature, but it was subject to distortion by surface skin effects during extremely calm conditions. Good agreement between the methods was found in four of five occasions; the fifth instance was a case of quiescent conditions distorting the results of thermal scanning. It was proposed that the methods be used jointly to achieve the best possible picture of thermal plume behavior. (Bender-ISWS)
W76-05156

LONGITUDINAL DISPERSION IN NATURAL CHANNELS,
Geological Survey of Canada, Ottawa (Ontario).
T. J. Day.
Water Resources Research, Vol. 11, No. 6, p 909-918, December 1975. 11 fig, 5 tab, 31 ref.

Descriptors: *Dispersion, *Channel flow, Natural flow, *Tracers, *Mixing, Flow, Flow profiles, *Path of pollutants, Convection, Movement, Water pollution, Channels, On-site investigations.
Identifiers: *Taylor's analysis, *Dispersion coefficient, *New Zealand.

The longitudinal dispersion of fluid particles in natural channels was investigated in an extensive series of experiments in small mountain streams (New Zealand). These experiments extended over a maximum distance of 2,250 m, a mean velocity range of 0.32-1.57 m/s, and a mean flow width range of 2.7-21.8 m. It was conclusively shown for these channels and others as well that the spread

or standard deviation of an initially concentrated mass increases linearly with distance and not as its square root, as is necessary for the application of Taylor's mixing model. One consequence of the linearity is an ever-increasing dispersion coefficient along the channel. It was also shown that the time-concentration curve of a dispersing tracer mass maintains a persistent asymmetry. This persistent asymmetry and the continued linear spreading appeared to be characteristic of dispersion in natural channels and as such showed the inadequacies of applying Taylor's analysis. (Bender-ISWS)
W76-05160

BIOCONCENTRATION AND BIOTRANSFER OF AFLATOXIN,
Colorado State Univ., Fort Collins. Dept. of Microbiology.
M. P. Nevins, and D. W. Grant.
Bulletin of Environmental Contamination and Toxicology, Vol. 6, No. 6, p. 552-558, November/December, 1971. 17 ref.

Descriptors: *Farm wastes, *Microorganisms, *Toxicity, *Feed lots, Cattle, Fish, Isolation, Path of pollutants, Food chains.
Identifiers: *Bioconcentration, *Biotransfer, *Aflatoxin, Substrate, Flies, Aspergillus flavus.

Research was undertaken to isolate aflatoxin-producing strains of Aspergillus flavus from manure and to demonstrate a potential path for the biotransfer and biomagnification of the aflatoxins in a simulated food chain. Toxigenic strains of A. flavus can be readily recovered from stockpiled feedlot manure. Under certain conditions, aflatoxin production within the manure can occur. Since the manure is attractive to several species of ovipositing flies, notably Musca domestica, ample opportunity exists for the biotransfer of the aflatoxin from the manure into the insect larvae. Maggots can convert the manure substrate into their biomass with an efficiency of 71 percent, after which the toxicity of the substrate increases. When this maggot-bioconcentrated crude aflatoxin was ingested by trout, severe aflatoxicosis was evident in the fish within 10 days. Although trout would have little access to toxic maggots, the fish could receive carcinogenic doses via ingestion of the flies developed from toxic larvae. It appears that serious environmental health problems could develop from the biotransfer and bioconcentration of aflatoxins originating in stockpiled manure. The problem is probably most prevalent in agricultural areas with favorable high temperatures and humidities. (East Central)
W76-05169

LEGAL IMPLICATIONS OF FEEDLOT POLLUTION IN NEBRASKA,
Nebraska Univ., Lincoln. Coll. of Agriculture and Home Economics.
For primary bibliographic entry see Field 5G.
W76-05173

POLLUTION EFFECTS ON SURFACE AND GROUND WATERS, (LITERATURE REVIEW),
Hawaii Univ., Honolulu. Dept. of Civil Engineering.
R. H. F. Young.
Journal Water Pollution Control Federation, Vol. 46, No. 6, p. 1419-1429, June, 1974. 103 ref.

Descriptors: *Water pollution sources, *Nutrients, *Heavy metals, Chemicals, Runoff, *Reviews, *Bibliographies, *Farm wastes, Groundwater, Radioisatapes, Soil contamination, Path of pollutants.
Identifiers: Biological contamination.

Literature concerning the pollution effects of various substances on surface and groundwater is reviewed. Among the substances covered are: nutrients, agricultural wastes, chemicals, heavy metals and radionuclides, and biological contamination. Nutrient enrichment sources cited were sewage treatment effluents, industrial wastes, urban runoff, and agricultural runoff. Documented sources of agricultural pollution were: (1) percolates from surface irrigated dairy manure slurrries, (2) storm runoff from cattle feedlots, (3) runoff from agricultural watersheds, and (4) seepage from wastewater irrigation. Chemical pollution sources were: oil field brine disposal; salt-water intrusion in coastal areas; irrigation-return flow; contaminants from outboard motor fuel; herbicides; use of deicing salts on highways; and the mobilization of the constituents in contaminated snow, such as heavy metals, oils, greases, phenols, and BOD from decaying organic matter. Heavy metal and radionuclide contamination sources were discharges from gold recovery operations, use of nuclear reactors, and nuclear weapons tests. Sources of biological contamination included: (1) slime outbreaks due to industrial or domestic wastewater effluents, (2) coliforms due to discharges from boats and a faulty septic tank, and (3) viruses from septage filtrates. Reclamation by groundwater recharge, soil pollution, and modeling analytical research methods were reviewd. (Penrod-East Central)
W76-05176

COMPLEXES AFFECTING THE SOLUBILITY OF CALCIUM CARBONATE IN WATER - PHASE II,
Illinois State Water Survey, Urbana.
For primary bibliographic entry see Field 8G.
W76-05180

CAPABILITY OF INTEGER PROGRAMMING ALGORITHMS IN SOLVING WATER RESOURCE PLANNING PROBLEMS,
Utah Center for Water Resources Research, Logan.
For primary bibliographic entry see Field 6A.
W76-05183

HEAT DISSIPATION FROM TURBULENT OPEN CHANNEL FLOW,
Georgia Inst. of Tech., Atlanta. School of Civil Engineering.
P. G. Mayer, and M. D. Moss.
Available from the National Technical Information Service, Springfield, Va 22161, as PB-250 745, $5.00 in paper copy, $2.25 in microfiche. Completion Report ERC-0376, Georgia Environmental Resources Center, Atlanta, January 1976. 79 p, 18 fig, 6 tab, 33 ref. OWRT A-048-GA(2), 14-31-0001-4010.

Descriptors: Path of pollutants, Water pollution control, *Open channel flow, Convection, Evaporation, *Thermal pollution, *Heat transfer, Cooling water, *Turbulent flow, Dispersion, Energy dissipation, Mixing, Turbulence, Dissipation, *Roughness(Hydraulic), Heated water.
Identifiers: Evaporative cooling, Convective mixing, *Heat dissipation.

The purpose was to establish quantitatively the effect of turbulence on heat dissipation in open channels. The study investigated systematically factors which affect heat transfer from open channel flow. Thus, an attempt was made to combine the thermodynamic and hydrodynamic phenomena in order to obtain design parameters. An examination was made of channel roughnesses as a means of additional mixing and hence of additional thermal transfer. The laboratory study showed the quantitative increase in evaporative cooling as a consequence of increased turbulent mixing in open channel flow and suggested artificially roughened channels as an alternate means of accomplishing the rejection of excess industrial heat into the environment. The theoretical study provided a means for the application of the study results to the design of open channels as an alternate means of dissipation of excess industrial heat.
W76-05248

DISTRIBUTION OF NUTRIENTS IN LOUISIANA'S COASTAL WATERS INFLUENCED BY THE MISSISSIPPI RIVER,
Louisiana Wildlife and Fisheries Commission, New Orleans. Div. of Oysters, Water Bottoms and Seafoods.
C. L. Ho, and B. B. Barrett.
Technical Bulletin No. 17, August 1975. 39 p 19 fig, 14 tab, 219 ref.

Descriptors: *Path of pollutants, *Chemical wastes, Organic compounds, Inorganic compounds, *Nutrients, Bays, Fisheries, Fishkill, *Industrial wastes, *Nitrogen, *Salinity, *Dissolved oxygen, *Mississippi River, Marshes, Oxygen demand, Water pollution effects, Agricultural chemicals, Gulf of Mexico, Sea water, *Louisiana.
Identifiers: Caminada Bay(La), Barataria Bay(La), Quatre Bayou Pass(La), Southwest Pass(La).

The Mississippi River is the source of a variety of inorganic nutrients and other chemical compounds for the Gulf of Mexico and particularly near shore waters. While these nutrients help form the basis for Louisiana's high fish production, uncontrolled disposal of industrial waste in the River may lead to a deterioration of fishing areas. Plants such as algae and sea lettuce grow uncontrolled when nutrients are available. Their subsequent decay often causes anaerobic conditions resulting in fish kills. To determine actual composition of coastal waters, sampling expeditions were undertaken in 1973, 3 when Mississippi waters were at a high level and once at a time of low flow. Water was taken from Caminada Bay, Barataria Bay, Quatre Bayou Pass, Southwest Pass, and offshore stations in water ranging in depth from less than 1.5 meters to about 12 m. In the shallow bay locations only surface water was collected, but in the deeper offshore areas surface and bottom were sampled because of pronounced water stratification. Analysis was done on shore as soon as possible and though some chemical changes occur when transporting samples it was felt that consistent procedures would give valid comparisons. The River contributes large amounts of NO3-, dissolved Si02, P04-3, and organic-N to the Gulf. Barataria and Caminada Bays are less affected by the River, there being less NO3 and NO2 and more NH4+N than in the near shore waters. During time of low river flow the nearshore waters were dominated by nutrient-depleted seawater. (Slmith-North- Carolina)
W76-05259

COMPARISON OF INORGANIC NITROGEN CONTENTS OF UNDISTURBED, CULTIVATED, AND BARNYARD SOIL PROFILES IN WISCONSIN,
Wisconsin Univ., Madison. Dept. of Soils.
R. J. Olsen, R. F. Hensler, O. J. Attoe, and S. A. Witzel.
Soil Science Society of America Proceedings, Vol. 34, No. 4, p. 699-700, July-August, 1970. 1 tab, 9 ref.

Descriptors: *Nitrates, *Nitrites, *Soil profiles, *Wisconsin, *Water pollution, *Soils, Path of pollutants, Water pollution sources, *Wisconsin.
Identifiers: Exchangeable ammonium, Ammonia-nitrogen, Nitrate-nitrogen.

The need for adequate disposal of increasing amounts of livestock wastes suggests that pollution of subsurface and surface waters from this source is likely to become of greater importance. Information was obtained on the contents of nitrate and other forms of inorganic nitrogen in soil profiles under various conditions in Wisconsin, particularly from cultivated fields, undisturbed or virgin locations, and from barnyards. The average total content of NO3-N in the

profile was lowest for the undisturbed soils and highest for the cultivated soils. The values for NO2-N were much lower. They were lowest in the well-drained barnyard profiles and highest in the poorly-drained ones. The values for exchangeable NH4-N varied more widely between profiles, were lowest for the cultivated soils and highest for the poorly-drained barnyard soils. The concentration of NO3-N tended to decrease with soil depth, apparently because of denitrification, microbial immobilization processes and plant uptake. The total content of NO2-N to the 240-cm depth ranged from 6 to 25 kg/ha. The results suggest that contamination of the groundwater with NO3-N from animal wastes would mainly concern farm families that consume water from wells located too close to barnyards and feedlots. Excessive rates of applying fertilizer N should be avoided. (Kehl-East Central)
W76-05263

SOURCES OF CONTAMINATION OF ARTESIAN WATERS BY CARCINOGENIC HYDROCARBONS, (IN RUSSIAN),
P. M. Vindyukov, G. L. Sardarova, and K. V. Kutakov.
Gig Sanit. 38(11): 98-99, 1973.

Descriptors: *Water pollution sources, *Artesian wells, *Confined water, Organic compounds, Phenols, Industrial wastes, Oil pollution, Organic wastes, Chemical wastes.
Identifiers: *Carcinogenic hydrocarbons, Carcinogens, *Benzo(a)pyrene.

The content of benzo(a)pyrene in artesian waters in 3 regions differing in hydrologic conditions was studied. The 1st region (control) was characterized by a reliable confining bed above the artesian horizon. The 2nd region had the same hydrologic conditions but as a result of an accident a one-time intense contamination of the artesian horizon (directly through the well) by industrial wastes containing phenol in high concentrations occurred. The 3rd region was characterized by unfavorable hydrologic conditions and presence of petroleum products on the surface which contaminated the artesian horizon for many years. The content of benzo(a)pyrene in artesian waters was related directly to pollution of the water source and especially its pollution by petroleum products. The presence of the carcinogen in the artesian waters of the control point (1st region), which was free from local chemical pollutants on the surface, suggested the presence of nautral background concentrations of benzo(a)pyrene in local subsurface waters.--Copyright 1975, Biological Abstracts, Inc.
W76-05265

DISPERSING OIL FILMS ON WATER.
For primary bibliographic entry see Field 5D.
W76-05281

AGRONIMIC EFFECTS OF THE LAND DISPOSAL OF WASTES FROM THE AGRICULTURAL AND FOOD INDUSTRIES (REPERCUSSIONS AGRONOMIQUES DES EPANDAGES D'EFFLUENTS DES INDUSTRIES AGRICOLES ET ALTIMENTAIRES,
Institut National de la Recherche A Agronomique, Versailles (France). Station Centrale d'Agronomie.
For primary bibliographic entry see Field 5D.
W76-05331

METHOD AND MEANS FOR MONITORING THE QUANTITY OF DISPERSED OIL IN WATER,
For primary bibliographic entry see Field 5A.
W76-05338

PREDICTING ANION MOVEMENT IN DISTURBED AND UNDISTURBED SOILS,
North Carolina State Univ., Raleigh. Dept. of Soil Science.
For primary bibliographic entry see Field 2G.
W76-05402

BACTERIAL POLLUTION IN LAKE BURLEY GRIFFIN,
Royal Military Coll., Duntroon (Australia). Dept. of Geography.
For primary bibliographic entry see Field 5C.
W76-05407

TIME-OF-TRAVEL OF SOLUTES IN THE TRINITY RIVER BASIN, TEXAS, SEPTEMBER 1973 AND JULY-AUGUST 1974,
Geological Survey, Fort Worth, Tex.
For primary bibliographic entry see Field 7C.
W76-05426

LEFT BEHIND--SOVIET MINE WASTES,
For primary bibliographic entry see Field 5G.
W76-05437

5C. Effects Of Pollution

SENSITIVITY OF VERTEBRATE EMBRYOS TO HEAVY METALS AS A CRITERION OF WATER QUALITY, PHASE III, USE OF FISH AND AMPHIBIAN EGGS AND EMBRYOS AS BIOINDICATOR ORGANISMS FOR EVALUATING WATER QUALITY,
Kentucky Water Resources Research Inst., Lexington.
W. J. Birge, A. G. Westerman, and J. A. Black.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-250 404, $4.00 in paper copy, $2.25 in microfiche. Research Report No. 91, January 1975. 31 p, 2 fig, 9 tab, 29 ref. OWRT B-044-KY(1). 14-31-0001-5077.

Descriptors: *Bioassay, *Bioindicators, Heavy metals, Water quality, Water pollution effects, *Kentucky, Mercury, *Fish eggs, Fish populations, *Embryonic growth stage, *Larval growth stage, Frogs, Amphibians, Cultures, Rainbow trout.
Identifiers: *Frog eggs, *Treefrogs, Species diversity.

Fish and amphibial eggs, embryos and early posthatched (larva) stages were evaluated as bioindicator organisms with which to monitor the quality of natural water resources. Eggs of 9 species were cultured in water collected from each of 11 Inner Bluegrass rivers and streams varying in quality from extremely poor to good. Cultures were maintained in vitro, using 12-hr changes of water. Averaging data for all 9 animal species, egg hatchability (embryonic survival) ranged from 0% for the most contaminated water to 94% for uncontaminated water found to support a healthy aquatic biota. Eggs of the squirrel treefrog and gray treefrog were the most sensitive of 5 amphibian species tested, and of 4 fish species, rainbow trout eggs proved most susceptible to water contaminants. Egg development provided an index to water quality which compared favorably with independent ecological indicators. In particular, the frequencies of embryonic mortality recorded for the 11 monitoring sites correlated with reductions in density and species diversity of piscine populations. Selected water sources were analyzed for mercury and other trace metals. Appreciable levels of metallic contaminants were found in those water sources which produced high levels of egg mortality. Egg hatchability was precluded or markedly reduced in all test waters where total mercury reached 0.3 ppb or more.
W76-05014

EFFECTS OF ARTIFICIAL DESTRATIFICATION ON POPULATIONS OF BENTHIC MACROINVERTEBRATES AND ZOOPLANKTON IN HAM'S LAKE AND ARBUCKLE RESERVOIR,
Oklahoma State Univ., Stillwater, School of Biological Sciences.
J. Wilhm.
Available from the National Technical Information Service, Springfiel,Va 22161, as PB-250 125, $5.00 in paper copy, $2.25 in microfiche. Oklahoma Water Resources Research Institute, Stillwater, Completion Report, (1976). 92 p, 2 fig, 50 tab, 42 ref, append. OWRT A-059-OKLA(1)

Descriptors: *Destratification, *Invertebrates, *Zooplankton, *Benthos, *Oklahoma, Reservoirs, Water temperature, *Dissolved oxygen, Pumping, Aquatic, animals, Aquatic populations, Water pollution effects.
Identifiers: Arbuckle Reservior (Okla), Ham's Lake(Okla), Species diversity.

Variations with depth of the density and diversity of benthic macroinvertebrates and zooplankton were observed in two Oklahoma reservoirs undergoing destratification attempts. Arbuckle Reservoir has about 24 x the surface area, 3 x the depth, and 78 x the volume of Ham's Lake. Temperature and dissolved oxygen of the water collected near the bottom at different depths during the benthic macroinvertebrate sampling in the two reservoirs were relatively uniform with depth in winter. In spring and summer dissolved oxygen progressively became more limiting in deeper waters. Dissolved oxygen increased in the bottom waters after pumping began in Ham's Lake, the smaller reservoir. No change was observed in the larger reservoir. The assemblage of benthic macroinvertebrates in other reservoirs generally was composed of a few common species and many rare species in the shallow depths and of a few abundant species in the deeper water. Although no consistent relationship was noted between macroinvertebrate species diversity and depth in either reservoir, species diversity decreased with depth. Density or diversity of zooplankton was not consistently related to depth in either reservoir nor did these variables reflect the severe oxygen limitations of deeper waters in summer.
W76-05017

OUTLINE OF FUTURE RESEARCH ACTIVITIES AT RICKLEA FIELD STATION, (IN SWEDISH),
Umea Univ. (Sweden). Dept. of Ecological Zoology; and Umea Univ. (Sweden). Dept. of Biology.
U. Karlstrom.
Zool Revy. 35(3): 135-138. 1973.

Descriptors: *Sampling, Energy, Rivers, Flow, *Secondary productivity, Methodology.
Identifiers: *Ricklea(Sweden), *Energy flow.

The research group at Ricklea field station (Sweden) has begun work to determine the magnitude of the driving forces and to quantify different components, particularly the secondary producers. Due to the obstacle of working in a river, the first steps were to elaborate methods for quantitative sampling. The slow-flowing parts of the River Ricklea permit easy sampling, but it is assumed that the largest portion of energy flow goes through the rapids.--Copyright 1975, Biological Abstracts, Inc.
W76-05046

CRITERIA FOR THE ECOLOGICAL EVALUATION OF THE LOWER MAIN RIVER, (IN GERMAN),
Natur-Museum und Forschungs-Institut Senchkenber, Frankfurt am Main (West Germany).
For primary bibliographic entry see Field 5B.
W76-05057

DRIFT OF MICROALGAE IN RICKLEAN, SWEDEN, (IN SWEDISH),
Umea Univ. (Sweden). Dept. of Ecological Zoology; and Umea Univ. (Sweden). Dept. of Biology.
S. Backlund.
Zool Revy. 35(3): 115-118.

Descriptors: *Algae, *Microoganisms, Nutrients, Light, *Aquatic drift.
Identifiers: *Ricklean(Sweden), Species composition.

Since the end of the 19th century there have been a number of investigations concerning the periodicity of algae in running waters. Sampling in the River Ricklea has been done since Feb. 1972. Out of a 50-ml sample the algae in 25 ml were counted. Light, nutrients and hydrological regime are the most important factors in determining the amount and composition of species of the drift over the year.--Copyright 1975, Biological Abstracts, Inc.
W76-05071

MERCURY DYNAMICS IN A WARMWATER STREAM RECEIVING MUNICIPAL WASTEWATER,
Michigan State Univ., East Lansing. Inst. of Water Research.
K. L. Bainbridge, F. M. D'Itri, and T. G. Bahr.
In: Proceedings of the 29th Industrial Waste Conference, Part Two, May 7-9, 1974, Lafayette, Indiana, Purdue University, p 597-607. 2 fig, 5 tab, 36 ref.

Descriptors: *Mercury, *Municipal wastes, *Activated sludge, Treatment facilities, Sewage treatment, *Waste water treatment, Fish, Benthos, Michigan, Golf courses, Fungicides, Chemical analysis, Sludge, Analytical techniques.
Identifiers: *Warm water stream, Chironomids, East Lansing(Mich), Red Cedar River(Mich), Flameless atomic adsorption technique.

Substantial amounts of mercury are removed in the activated sludge process. A mercury budget for the East Lansing, Michigan, Sewage Treatment Plant was developed. Mercury levels in fish, benthos, water and sediment taken from a stretch of the Red Cedar River which receives the plant's effluents, were determined. The effects of mercury fungicides applied to a golf course adjacent to a river were determined. Four sampling stations were set up on the river. Samples collected included: sediments; benthos; sludge filter cake; water; raw sewage; final effluent; fish; and crayfish. The flameless atomic adsorption technique was used to measure total mercury. The mean concentration of mercury in the sediment ranged from 0.04 parts per million (ppm) upstream to 0.40 ppm downstream. Mercury concentrations in fish ranged from 0.17 ppm to 0.72 ppm. Predator species contained two to three times as much mercury as grazers or bottom feeding omnivores. Mean mercury concentrations of 0.15 ppm were found in Chironomids collected right below the sewage treatment plant outfall. It was estimated that about 70 grams of mercury per day enter the sewage treatment plant and about 20 grams per day enter the river through the outfall. The rest is adsorbed onto the sludge which is filtered and incinerated, causing the mercury to be released into the atmosphere. Only weak evidence suggests that mercury from the fungicides used on the golf course, which have been stopped, were entering the river. (Pinto-FIRL)
W76-05077

DISPOSAL OF SEWAGE SLUDGE TO SEA; UNITED KINGDOM EXPERIENCE AND PRACTICE,
Ministry of Agriculture, Fisheries and Food, Burnham-on-Crouch (England). Fisheries Lab.
For primary bibliographic entry see Field 5E.
W76-05085

PRELIMINARY SUMMARY OF SLUDGE DEGRADATION STUDIES IN A MARINE BENTHIC ENVIRONMENT,
Pacific Northwest Environmental Research Lab., Corvallis, Oreg.
W. P. Muellenhoff.
In: Research Symposium on Pretreatment and Ultimate Disposal of Wastewater Solids, May 21-22, 1974, New Brunswick, New Jersey, Rutgers University, p 349-389. 9 fig, 7 tab, 25 ref, 1 append.

Descriptors: *Sludge, *Degradation(Decomposition), Sewage sludge, Domestic wastes, Sewage, Carbon, Organic compounds, Inorganic compounds, Stabilization, Sulfates, Phosphates, Mathematical models, Oxidation-reduction potential, Dissolved oxygen, Benthic flora, Benthic fauna, Marine biology, Bioindicators, Pollutant identification.
Identifiers: *Total carbon, *Total inorganic carbon, Kjeldahl nitrogen, Organic carbon.

The rate and extent of the decrease of organic carbon in a digested domestic sewage sludge deposited on the sea floor were determined in laboratory and field tests. Total carbon (TC) and total inorganic carbon (TIC) were measured as indicators of the stabilization process, and sulfate, phosphate, nitrate, and Kjeldahl nitrogen were measured to record the chemical characteristics of the sludge. Concentrations of TC were found to decrease approximately 70% after 80 days at a pressure of one atmosphere. The TC decreased 30% in 47 days at increased pressure to simulate the deep sea. Oxygen consumption rates ranged from 3.74 to 0.55 02/sq m/day depending on the sludge source, type of digestion and time since deposit. Dissolved oxygen was depleted beyond one mm in the bed. Oxidation-reduction potential ranged from +150 mv at the sludge bed surface to -100 mv at 2 cm. Diffusion of hydrogen sulfide into underlying sediments began at 24 days and proceeded at a rate of 0.09 mm/day. Due to compaction, sludge beds decreased to one-half their original thickness in 80 days. Approximately 60% of all compaction occurred in the first day. A mathematical model of dissolved particulate and gaseous fractions of sludge bed carbon is being formulated to better understand the mechanisms and transfer rates of the sludge bed carbonaceous materials. (See also W76-05079) (Pinto-FIRL)
W76-05086

BIOASSAY METHODS AND IMPACT EVALUATION OF OCEAN DISPOSAL SITES,
Mounmouth Coll., West Long Branch, N. J.
For primary bibliographic entry see Field 5A.
W76-05087

EVALUATING THE IMPACT OF SLUDGE DISCHARGE TO SANTA MONICA BAY, CALIFORNIA,
California Univ., Berkeley; and Southern California Coastal Water Research Project, Berkeley.
F. K. Mitchell.
In: Research Symposium on Pretreatment and Ultimate Disposal of Wastewater Solids, May 21-22, 1974, New Brunswick, New Jersey, Rutgers University, p 417-433. 12 fig, 3 tab, 2 ref.

Descriptors: *Evaluation, *Sludge disposal, *California, *Sludge, Municipal wastes, Sludge digestion, Solids, Chemical oxygen demand, Sediments, Metals, Nitrogen, Phosphorus, Environmental effects.
Identifiers: *Santa Monica Bay(Calif), Santa Monica Canyon(Calif), Los Angeles(Calif), Ocean disposal, Sludge outfall.

Physical, chemical and biological effects of sludge discharge to Santa Monica Bay, California, are discussed. Municipal waste water from the City of Los Angeles is discharged through two separate outfalls. A detailed characterization of the waste material being discharged was made. It was found that the digestion of the primary sludge resulted in significant reductions of total solids, volatile matter, chemical oxygen demand, and grease without affecting the concentrations of total nitrogen and total phosphorus. Mass emission rates of the sludge discharge are similar to those of the combined primary and secondary effluents. Physical and chemical properties of the ocean sediments in the bay have been altered by the waste discharges, with the greatest effects observed in Santa Monica Canyon and near the sludge outfall. Depth profiles of sediment heavy metals concentrations indicate that the depths of significant quantities of sludge particulates are greater than one foot near the sludge outfall and one foot or less at distances greater than two miles down canyon from the sludge discharge. Although the areas affected are not biological deserts, biological evidence of environmental stress in the vicinity of the discharges has been found. (See also W76-05079) (Pinto-FIRL)
W76-05088

DETECTION OF SALMONELLAE IN THE ENVIRONMENT,
Center for Disease Control, Atlanta, Ga.
For primary bibliographic entry see Field 5A.
W76-05100

THE ENERGY FLOW THROUGH A LOTIC ECOSYSTEM, (IN SWEDISH),
Umea Univ. (Sweden). Dept. of Biology; and Umea Univ. (Sweden). Dept. of Ecological Zoology.
For primary bibliographic entry see Field 5B.
W76-05124

BACKGROUND PAPERS FOR A WORKSHOP ON INPUTS, FATES, AND EFFECTS OF PETROLEUM IN THE MARINE ENVIRONMENT, VOLUME I.
National Research Council, Washington, D.C. Ocean Affairs Board.
For primary bibliographic entry see Field 5B.
W76-05135

THE ENVIRONMENTAL IMPACT OF AN OFFSHORE OIL SPILL,
Chevron Oil Field Research Co., La Habra, Calif.
C. D. McAuliffe.
In: Background Papers for a Workshop on Inputs, Fates, and Effects of Petroleum in the Marine Environment, Volume I; Ocean Affairs Board Workshop held May 21-25, 1973, Airlie, Virginia. National Academy of Sciences, Washington, D.C., p 223a - 279, May 1973. 63 ref.

Descriptors: *Oil spills, *Environmental effects, *Aquatic environment, Ships, Accidents, Oil wells, Offshore platforms, Oil, Oil pollution, Water pollution, Oceans, Shores, Chemistry, Hazards, Aquatic plants, Aquatic animals, Biology, Marine biology.

The impact of an oil spill will depend upon the volume of spill, duration of spill, type of petroleum product, water temperature, and wind, wave, current conditions. An analysis of the environmental impact of an offshore oil spill incident was addressed to: (1) properties of oils and fate in marine environment, (2) effects on water quality, (3) effects on marine life, and (4) possible hazards to man. The biologic effects of ten major oil spills were discussed in detail. (See also W76-05135) (Sims-ISWS)
W76-05148

METHODS FOR STUDYING THE EFFECTS OF MARINE OIL SPILLS,
Woods Hole Oceanographic Inst. Mass.
J. F. Grassle.
In: Background Papers for a Workshop on Inputs, Fates, and Effects of Petroleum in the Marine Environment, Volume I; Ocean Affairs Board

Workshop held May 21-25, 1973, Airlie, Virginia. National Academy of Sciences, Washington, D.C., p 322a-346a, May 1973. 3 fig, 3 tab, 58 ref.

Descriptors: *Oil spills, *Environmental effects, *Benthic fauna, Oil, Oil pollution, Water pollution, Ships, Offshore platforms, Accidents, On-site investigations, Sampling, Analytical techniques, Benthos, Sediments, Aquatic life, Marine biology.

Features of several biological studies of oil spills were discussed and these recommendations were made: (1) the distribution of oil from spillages should be determined and a sampling program should be initiated to include both affected and unaffected areas (controls); (2) the sampling program must include samples for chemical and sediment analysis as well as biological samples; (3) the benthic subtidal and intertidal benthic infauna are likely to be severely affected by oil and may be quantitatively sampled to yield a relatively clear result; (4) whole taxa rather than selected species should be used in assessing effects; (5) all results should include species identification; (6) screens used in separation of animals from sediments should be small enough to include the whole size range of individuals of the species studied; and (7) sampling should include enough replication to clearly indicate that samples are representative. (See also W76-05135) (Sims-ISWS)
W76-05152

ANALYTICAL APPROACH IN THE EVALUATION OF BIOLOGICAL DAMAGE RESULTING FROM SPILLED OIL,
Consortium of Universities for Water Research, Montreal (Quebec).
G. La Roche.
In: Background Papers for a Workshop on Inputs, Fates, and Effects of Petroleum in the Marine Environment, Volume I; Ocean Affairs Board Workshop held May 21-25, 1973, Airlie, Virginia. National Academy of Sciences, Washington, D.C., p 346b-374, May 1973. 4 ref.

Descriptors: *Oil spills, *Water pollution effects, *Fish, *Testing procedures, Biology, Marine biology, Laboratory tests, Oil, Oil pollution, Aquatic life, Water pollution, Clams, Fish toxins, Fishkill, Fish reproduction.

Sensitive interdisciplinary approaches should be used in the evaluation of biological damage resulting from pollutant exposures. This preliminary study showed evidence of damage with rather low single doses of crude oil or crude oil fractions, over a relatively short period of exposure (168 hours). None of the fish exposed or held as controls died during the 168 hour exposures described here. It would appear that, with the changes observed in the chemoreceptors or olfactory systems of exposed fish, they could just as well have died since they could not conceivably perceive changes in an otherwise viable natural environment. This indicated that it is not necessary to have mass kills to eliminate species from a particular area. All that is needed is to prevent them from coping with a viable environment by destroying their means of perception without which they cannot either find food, escape predators, or perform natural reproductive functions. (See also W76-05135) (Sims-ISWS)
W76-05153

BIOCONCENTRATION AND BIOTRANSFER OF AFLATOXIN,
Colorado State Univ., Fort Collins. Dept. of Microbiology.
For primary bibliographic entry see Field 5B.
W76-05169

BORON TOXICITY IN RED PINE FOLLOWING MUNICIPAL WASTE WATER IRRIGATION-RUA.
New Zealand Forest Service, Rotorua.
D. G. Neary, G. Schneider, and D. P. White.
Soil Science Society of America Proceedings, Vol. 39, No. 5, p 981-982, September-October, 1975. 1 fig, 2 tab, 10 ref. OWRT A-055-MICH(2).

Descriptors: *Boron, *Waste water(Pollution), *Waste water disposal, *Municipal wastes, *Red pine trees, Toxicity, Effluents, Nutrients, Irrigation, Foliar, Mass spectrometry, Humus, Soil profiles.
Identifiers: Nutrient absorption capacity, Land treatment sites, Necrosis, Middville(Mich), Nutrient toxicities.

Plants have a high nutrition absorption capacity and are susceptible to various nutrient toxicities. Minor chemical constituents in municipal wastes can cause contamination at land treatment sites. Studies have been conducted in which boron in waste water has been suspected to cause necrosis, or browning of the tips of pine needles, in the red pine tree. The effects of waste water containing concentrations of boron on red pines was studied. A number of plots were irrigated with varying amounts of waste water effluent from the Middevill, Michigan, waste water oxidation ponds. The irrigation was conducted over a period of two summers. Samples of the waste water analyzed weekly before irrigation showed low concentrations of boron. At the end of the irrigation the foliage was collected and ashed and analyzed for boron using a mass spectrograph. Humus collected in the area was analyzed in the same way. Evidence of foliar toxicity was noted in trees receiving 25, 50 and 88 mm/week of waste water despite the low concentration of boron. The effect can accumulate over a short period of time. Boron was found in even higher concentrations in the humus than in the foliage of the red pines. It was also found in high concentrations within the upper 30 cm of the soil profile. This raises questions about the feasibility of irrigating forest systems with waste water. (Pinto-FIRL)
W76-05177

SELECTIVE TOXICITY OF DETERGENTS AND HERBICIDES TO PHYTOPLANKTON,
Purdue Univ., Lafayette, Ind. Dept. of Botany and Plant Pathology.
C. A. Lembi, and S. E. Coleridge.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-250 497, $5.00 in paper copy, $2.25 in microfiche. Purdue University Water Resources Research Center W. Lafayette, Technical Report No. 71. December 1975. 71 p, 28 tab, 42 ref. OWRT-A-025-IND(1).

Descriptors: *Detergents, *Phytoplankton, *Pesticide toxicity, Surfactants, Algae, Scenedesmus, Diatoms, *Herbicides, 2-4-D, Cyanophyta, Toxicity, Phosphates, *Phosphorus, *Growth rates, Water pollution effects.
Identifiers: *Phosphate detergents, *Carbonate detergents, Silvex, Micrasterias, Ankistrodesmus, Golenkinia, Pediastrum, Navicula.

The current trend to remove phosphorus from detergents has resulted in the replacement of phosphate-based products with inadequately tested carbonate-based detergents. Additional studies were conducted on the effects of the phenoxy herbicides 2,4-D and silvex on phytoplankton. Carbonate detergents at low concentrations stimulated diatom growth. At higher carbonate concentrations the increased alkalinity favored bluegreen algae over the diatoms. In comparing phytoplankton cultures treated with carbonate and phosphate detergents, the carbonate products caused the least growth reduction to bluegreen algae and were more toxic to diatoms at lower concentrations. Diatoms were not affected by silvex acid at 140 ppm; however planktonic green algae were affected at concentrations as low as 35 ppm. Growth of the phytoplankters, Scenedesmus, Ankistrodesmus, and Pediastrum was markedly decreased by 110 and 220 ppm 2,4-D acid, a sensitivity not previously noted by other researchers. Neither herbicide, however, caused complete mortality, even at highest concentrations.
W76-05181

THE EFFECTS OF A MARSH ON WATER QUALITY,
Hope Coll., Holland, Mich. Dept. of Biology.
For primary bibliographic entry see Field 5G.
W76-05182

OBSERVATIONS ON PHYTOPLANKTON AND PRIMARY PRODUCTION IN THE REGION OF THE ARGUIN BANK (MAURITANIA) IN APRIL AND MAY 1972, (IN FRENCH),
Museum National d'Histoire Naturelle, Paris (France). Laboratoire des Peches Outre-Mer.
J. Reyssac.
Bull Inst Fondam Afr Noire Ser A Sci Nat. 36(1): 51-61. 1974.

Descriptors: *Phytoplankton, Diatoms, Chlorophyll, *Primary production, Salinity, Temperature, *Dinoflgellates, Gymnodinium.
Identifiers: Arguin Bank, Caron-14, Ceratium, Coccolithophorid, *Mauritania, Upwelling.

Observations were made in the E and W zones. The water in the former is warm and of high salinity and is unaffected by upwelling. That in the latter is affected by upwelling, colder and of lower salinity. The phytoplankton density is about 1 million cells/l in both. Most of it is microplankton, consisting chiefly of diatoms. The most important dinoflagellates are Gymnodinium in the east and Ceratium in the west. The nannoplankton consists mainly of coccolithophorids. Chlorophyll a and primary production (measured by the C14 method) are higher and more variable spatially in the west. In the east the lowest concentrations were found near the center of upwellings, the higher ones near their peripheries. Copyright 1975, Biological Abstracts, Inc.
W76-05229

NUTRIENT DYNAMICS AND GAS PRODUCTION IN AQUATIC ECOSYSTEMS: THE EFFECTS AND UTILIZATION OF MERCURY AND NITROGEN IN SEDIMENT-WATER MICROCOSMS,
Utah Center for Water Resources Research, Logan.
D. B. Porcella, V. D. Adams, P. A. Cowan, S. Austrheim Smith, and W. F. Holmes.
Available from the National Technical Information Service, Springfield, Va 22161, as PB-250 704, $6.00 in paper copy, $2.25 in microfiche. Utah Water Research Laboratory Publication PRWG-121-1, November 1975. 142 p, 51 fig, 23 tab, 110 ref, 4 append. OWRT B-081-UTAH(2), 14-31-0001-3942.

Descriptors: Eutrophication, Reservoirs, *Nutrients, *Phosphorus, *Nitrogen, Carbon, Iron, *Mercury, *Algae, *Gases, *Ecosystems, Cyanophyta, *Sediment-water interfaces, Anabaena, Analytical techniques, Lakes, Productivity, Sediments.
Identifiers: Hyrum Dam(Utah), *Microcosm technique, Nutrient dynamics.

Sixteen sediment-water microcosms designed to allow complete gas, liquid, and solid mass balances of gases, nutrients, and mercury were studied under dark conditions or varying light intensity for a period of 189 days. Results indicated that the microcosm technique is a very sensitive method of analyzing microbial dynamics in sediment water systems. Gas quantity and composition changes were easy to monitor and were especially sensitive to light and nutrient variations. Nitrogen fixation occurred in all lighted systems (blue-green algae nitrogen fixers, Anabaena, and others) and was adequate to insure that no nitrogen limitation occurred even though nitrogen limitation was imposed on the system. Sediments

apparently did not act as a significant source of nitrogen. Iron and phosphorus were in excess and as such were closely linked as would be predicted on the basis of chemical equilibria. Non-equilibrium chemical behavior of such elements would apparently result only when appreciable amounts of the compound or element are utilized in growth. The microcosm technique is an excellent method for showing nutrient dynamics in sediment-water systems; the control of environmental variables allows interpreting at least some of the major factors which control productivity in lakes.
W76-05246

NATURALLY OCCURRING ORGANIC COMPOUNDS AND ALGAL GROWTH IN A EUTROPHIC LAKE,
Utah Center for Water Resources Research, Logan.
V. D. Adams, R. R. Renk, P. A. Cowan, and D. B. Porcella.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-250 730, $6.00 in paper copy, $2.25 in microfiche. Utah Water Research Laboratory Publication PRWG137-1, June 1975. 140 p, 18 fig, 16 tab, 303 ref, 3 append. OWRT B-104-UTAH(1), 14-31-0001-4134.

Descriptors: Eutrophic zone, Lakes, *Organic compounds, *Algae, Gas chromatography, Mass spectroscopy, *Utah, *Eutrophication, Water pollution effects, Reservoirs, Bioassay, Chlamydomonas, Pollutant identification.
Identifiers: Hyrum Reservoir(Utah), *Algal growth, Acetaldehyde, Methanol, Ethanol, Propanal, Acetone, Propanol, Aphanizomenon, *Eutrophic lakes.

The literature was reviewed with respect to naturally occurring organic compounds. Their identity and effects on life forms are listed in tabular form. Methods of separation and identification of trace organics in aquatic systems are discussed and applied to a reservoir. Six organic compounds (acetaldehyde, methanol, ethanol, propanal, acetone, and 2-propanol) were identified and monitored in the reservoir from September 1974 to April 1975. Algal populations were simultaneously observed and bioassays were performed on some of these populations to determine the effects of the compounds. No effects of the compounds on the algae were observed at the concentration levels found in the reservoir. Possible sources of these compounds were discussed. Chlamydomonas reinhardi (axenic culture) produce ethanol, propanal, and acetone, thus suggesting possible alga sources of the compounds observed. In the fall of the year, high concentrations of methanol, ethanol, and acetone are the result of bacterial action on dying mats of Aphanizomenon.
W76-05253

DISTRIBUTION OF NUTRIENTS IN LOUISIANA'S COASTAL WATERS INFLUENCED BY THE MISSISSIPPI RIVER,
Louisiana Wildlife and Fisheries Commission, New Orleans. Div. of Oysters, Water Bottoms and Seafoods.
For primary bibliographic entry see Field 5B.
W76-05259

THE EXCHANGE AND GROWTH POTENTIAL OF PHOSPHORUS IN ALGAE CULTURES,
Texas Tech Univ., Lubbock. Dept. of Civil Engineering.
R. M. Sweazy, M. C. Lockett, G. W. Reid, and J. M. Robertson.
International Journal Environmental Studies (G.B.), Vol. 7, No. 3, p. 193-200, 1975. 8 fig, 3 tab, 3 ref. OWRT B-177-TEX(5).

Descriptors: *Phosphorus, *Algae, *Growth rates, *Eutrophication, Mathematical models, Mode of action, Laboratory tests, Absorption, Water pollution effects, Cultures.
Identifiers: Algal growth potential.

To establish relationships between total phosphorus budget, available phosphorus, algal growth, and eutrophication, water containing dissolved solids, nitrogen, phosphorus, minerals, and vitamins was used to culture starved algal populations. Applicability of the Watt-Hayes Steady State Model describing phosphorus transfer and exchange to eutrophication was determined. From inorganic, particulate, and organic steady state phosphorus concentrations and exchange rates resulting from various phosphorus inputs, equations predicting exchange rates, teady state phosphorus concentrations, and maximum algal growth were developed. Correlations between initial and resulting particulate steady state phosphorus concentrations and between particulate steady state phosphorus concentrations and maximum algal growth were high. Although the equations developed from this study are valid for data obtained in the investigation, factors such as sediment-water interchange, littoral vegetation, and other chemical, physical, or biological processes should be considered for proper representation. If inorganic and organic phosphorus concentrations are such that plankton uptake rate balances loss rate, no particulate phosphorus increase is possible without external input. With inorganic or organic phosphorus additions, plankton loss and uptake rates are altered and new steady state phosphorus concentrations result. Severe eutrophication can be defined in terms of phosphorus addition in high enough concentrations to prevent establishment of steady state conditions. (Buchanan-Davidson--Wisconsin)
W76-05266

EFFECT OF PHENOLS AND THEIR OXIDATION PRODUCTS ON AQUATIC PLANTS AND CONTENT OF SULFHYDRYL GROUPS IN THEM, (IN RUSSIAN),
Irkutskii Gosudarstvennyi Universitet (USSR).
D. I. Stom, L. P. Bobovskaya, S. S. Timofeeva, G. V. Kalmychkov, and O. M. Kozhova.
Dokl Akad Nauk SSR Ser Biol. 216(3): 698-701, 1974.

Descriptors: *Phenols, Aquatic plants, *Oxidation, *Toxicity, Water pollution effects, Organic compounds, Organic wastes, Chemical wastes, Absorption.
Identifiers: *Dunaliella-Sp, *Elodea-Canadensis, *Nitella-Sp, *Pyrocatechol, *Hydroquinone.

Experiments on aquatic plants (Elodea canadensis, Nitella sp., Dunaliella sp.) to determine the possible relation between the ability of aquatic plants to oxidize phenols and the effect of phenolic compounds on the content of sulfhydryl and disulfide groups in plant tissue showed that the higher toxicity of pyrocatechol and hydroquinone for aquatic plants in comparison with other phenols is related with their ability to oxidize phenols. One of the most probable biochemical mechanisms of the manifestation of the toxic effect of the oxidation products of phenols is the blocking of sulfhydryl groups by them. The oxidation of pyrocatechol and hydroquinone uptake into the cell, which is accompanied by a decrease of the content of sulfhydryl groups, the inability of solutions of p-benzoquinone, pyrocatechol and hydroquinone to inhibit the movement of protoplasm in the presence of thiol compounds in the incubation medium and the presence of general features in the effect of quinones and the metabolic poison sodium p-chloromercuribenzoate on plants: all these facts indicated the specific, selective effect of quinones, pyrocatechol and hydroquinone on aquatic plants. --Copyright 1975, Biological Abstracts, Inc.
W76-05276

STRATEGY OF BIOLOGICAL MONITORING, (IN RUSSIAN),
For primary bibliographic entry see Field 5A.
W76-05301

THE CAUSE OF TROUT FISH KILLS OCCURRING IN THE WATER FROM THE AERATED HYPOLIMNION OF DEEP LAKES,
Georgia Inst. of Tech., Atlanta. Engineering Experiment Station.
R. S. Ingols.
Available from the National Technical Information Service, Springfield, Va 22161, as PB-250 721, $4.00 in paper copy, $2.25 in microfiche. Georgia Environmental Resources Center, Atlanta, Report No. ERC 0176, January 1976, 16 p, 1 fig, 4 tab, 18 ref. OWRT A-056-GA(1). 14-31-0001-5010.

Descriptors: *Fishkill, *Hypolimnion, *Dissolved oxygen, *Sulfides, *Manganese, Metals, Hardness(Water), *Trout, Lakes, *Georgia, *Arkansas, Anaerobic bacteria, *Toxicity, Lethal limit, Impoundments, Fish hatcheries, Water pollution effects.
Identifiers: Metal ions, Lanier Lake(Ga), Greers Ferry Hatchery(Ark).

The need for large volumes of cold water to culture trout in Georgia and Arkansas has led to the use of the hypolimnetic water of power impoundments. The need for dissolved oxygen (DO) in the water has been well established. Long periods of stratification produces zero DO. This condition has permitted the solution of metal ions and the production of anaerobic bacterial by-products. Sulfides have been generated in sufficient concentration to be the dominant lethal factor below Lake Lanier. Manganese at 1.0 and 2.0 mg/l appears to be the dominant lethal factor at the Greers Ferry Hatchery in Arkansas, although sulfides may also contribute. The toxicity of 5 mg/l manganese can be controlled by the presence of enough calcium ions in the water according to the data of this report. Hydrogen peroxide can reduce hydrogen sulfide toxicity. Permanganate has been used to reduce the toxicity of both lethal factors, but must be carefully controlled.
W76-05325

SOME GENERAL RELATIONS BETWEEN THE BIOMASS OF PLANKTONIC FILTER FEEDERS AND THEIR FOOD, (IN RUSSIAN),
Akademiya Nauk SSSR, Leningrad. Zoologicheskii Institut.
G. G. Vinberg.
Gidrobiol Zh. 10(5): 109-112, 1974.

Descriptors: *Biomass, *Bacteria, *Zooplankton, Phytoplankton, *Food chains, Food webs.
Identifiers: *Plantonic filter feeders.

Formulas are presented for determining the relation between the biomass of zooplankton filter feeders and biomass of bacterioplankton or phytoplankton in a general form applicable to the particular case of a stationary biomass of the food being consumed.--Copyright 1975, Biological Abstracts, Inc.
W76-05326

HYGIENIC ASSESSMENT OF CERTAIN SURFACE-ACTIVE SUBSTANCES-THE COMPONENTS OF EFFLUENTS FROM TEXTILE INDUSTRY ENTERPRISES (GIGIYENICHESKAYA OTSENKA NEKOTORYKH POVERKHNOST-NOAKTIVNYKH VESHCHESTV-KOMPNENTOV STOCHNYKH VOD PREDPRIYATIY TEKSTIL'NOY PROMYSHLENNOSTI),
For primary bibliographic entry see Field 5A.
W76-05342

AN ASSESSMENT OF EUTROPHICATION IN AUSTRALIAN INLAND WATERS,
Department of Environment, Canberra (Australia).
G. Wood.

Australian Water Resources Council, Canberra, Technical Paper No. 15, 1975. 238 p 8 fig, 16 tab, 590 ref.

Descriptors: *Eutrophication, *Australia, *Reviews, *Research priorities, Aquatic environment, Nutrients, Water quality, Freshwater, Surface waters, Information exchange, *Bibliographies, Water pollution effects.

The results are presented of a project undertaken to review international research work on eutrophication, to assess the applicability of the information to Australian conditions, and to identify problem areas requiring research in Australia. It is concluded that, judging by the results of overseas research, Australian conditions are such that actual or potential loss of water quality through eutrophic effects probably exists. However, there is and has been insufficient relevant research in Australia to identify possibly unique features of its aquatic environment which might reinforce or mitigate this conclusion. Information is lacking over such a broad range that no research effort is likely to be wasted by duplication; but collection and coordination of results at catchment, State and national level is necessary. The establishment of a National Water Research Centre should be considered. (CSIRO)
W76-05405

BACTERIAL POLLUTION IN LAKE BURLEY GRIFFIN,
Royal Military Coll., Duntroon (Australia). Dept. of Geography.
J. S. Burgess, and L. J. Olive.
Water (Journal of the Australian Water and Wastewater Association) Vol. 2, No. 4, p 17-20, December, 1975. 2 fig, 4 tab, 8 ref.

Descriptors: *Water pollution sources, *Coliforms, *Lakes, *Australia, *Sewage bacteria, Watersheds(Basins), Recreational facilities, Urban runoff, Surface runoff, Bacteria, Water pollution effects.
Identifiers: Lake Burley Griffin(A.C.T.), Queanbeyan(N.S.W.), Canberra(A.C.T.).

Recreational use of Lake Burley Griffin in the Australian Capital Territory is sometimes interrupted by violation of bacterial standards. It has been thought that high levels of faecal coliforms in the lake are simply the result of discharge of sewage into the headwaters by the nearby town of Queanbeyan. Examination of bacterial counts in the lake and in the catchment areas reveal that, while discharges of Queanbeyan sewage are a major source of faecal coliforms, significant inputs also occur from rural and Canberra urban runoff. (CSIRO)
W76-05407

EFFECTS OF AIR INJECTION AT PROMPTON LAKE, WAYNE COUNTY, PENNSYLVANIA,
Geological Survey, Harrisburg, Pa.
For primary bibliographic entry see Field 5G.
W76-05413

THE EFFECT OF TREMATODE LARVAL INFESTATION OF HYDROBIA ULVAE ON ITS RESISTANCE TO DRYING AND WATER-FRESHENING, (IN RUSSIAN),
Akademiya Nauk SSSR, Leningrad. Zoologicheskii Institut.
V. Ya. Berger, and A. P. Kondratenkov.
Parazitologiya (Leningr). 8(6): 563-564, 1974.

Descriptors: *Gastropods, *Tremotodes, *Invertebrates, Worms, Aquatic animals, *Infection, Drying, Water purification, Larvacides, Resistance, Water pollution effects.
Identifiers: Cryptocotyle-Sp, Hydrobia-Ulvae, Maritrema-Subdolium, Microphallus-Somateriae, Paramonostomum-Alveatum.

Gastropods H. ulvae infected with trematode larvae (KMaritrema subdolium, Cryptocotyle sp., Microphallus Somateriae, Paramonostomum alveatum) have a lower resistance to drying and water-freshening as compared to sterile animals. The deterioration in the isolation of organisms from the environment affects the resistance, proved by a high salt l oss rate in infected hydrobians placed into distilled water. Copyright 1975, Biological Abstracts, Inc.
W76-05421

EFFECT OF SALINITY ON THE SURVIVAL AND REPRODUCTIVITY OF OLIGOCHAETES OF THE FAMILY TUBIFICIDAE OF THE DNIEPER-BUG ESTUARY, (IN RUSSIAN),
T. G. Moroz.
Gidrobiol Zh. 10(5): 102-104, 1974.

Descriptors: *Oligochaetes, *Salinity, Estuaries, *Reproduction, Mortality, *Tubificids, Water pollution effects.
Identifiers: Limnodrilus-Claparedeanus, Potamothrix-Hammoniensis, Potamothrix-Moldaviensis, Psammoryctides-Barbatus, *USSR(Dnieper-Bug Estuary).

Data from an investigation of freshwater oligochaetes of the family Tubificidae, the euryhaline Psammoryctides barbatus, Potamothrix hammoniensis and Potamothrix moldaviensis and the oligohaline Limnodrilus clapareanus are presented showing that a brief increase of salinity is not lethal, but only reduces the abundance of the populations and in certain cases impoverishes the species composition. A further increase of salinity in the Dnieper-Bug Estuary (USSR) (more than 13%) leads to 100% mortality in these freshwater species; for most this limit was even lower.--Copyright 1975, Biological Abstracts, Inc.
W76-05454

DIELDRIN CONTAMINATION OF CHANNEL CATFISH, INVERTEBRATES AND MINNOWS FROM THE DES MOINES RIVER,
Iowa Cooperative Fishery Unit, Ames.
R. L. Kellogg.
Available from the National Technical Information Service, Springfield, Va 22161, as PB-251 046 $5.50 in paper copy, $2.25 in microfiche. MS thesis, 1974. 120 p. 25 tab, 81 ref, 1 append. OWRT A-042IA (2).

Descriptors: *Pesticide residues, *Chlorinated hydrocarbon pesticides, *Channel catfish, *Invertebrates, *Minnows, Dieldrin, Iowa, Seasonal, Aldrin, Fish food organisms, Aquatic insects, DDE, DDT, Crayfish, Mayflies, Agricultural runoff.
Identifiers: Des Moines River(Iowa), Biomagnification.

Dissolved and suspended dieldrin fractions varied seasonally. Positive correlation between dissolved dieldrin and surface runoff, but not between suspended dieldrin and surface runoff supported the hypothesis that agricultural aldrin applications caused dieldrin in the river due to runoff. Dieldrin varied in bottom sediments seasonally, but was higher in suspended matter. Seasonal dieldrin variations were observed in aquatic insects and minnows; DDE levels remained static, and DDT was low. In crayfish, dieldrin was low and DDE-DDT higher. In minnows dieldrin varied seasonally and between species; DDT was low; and DDE was often higher and varied seasonally. Dieldrin varied with catfish size; DDE-DDT levels were generally higher and increased with size. Catfish condition factors correlated positively with size but not with dieldrin levels. Biomagnifications for aquatic insects, minnows, and catfish were 4620, 7540, and 6920, respectively. Dieldrin biomagnification from catfish food to muscle tissue was low, suggesting that the principal dieldrin source was water not food. Seasonal dieldrin trends in aquatic organisms did not correspond to dieldrin exposure levels, suggesting that other environmental and physiological factors are important regulators of dieldrin dyanmics in these organisms. (Buchanan-Davidson--Wisconsin)
W76-05457

EFFECT OF SURFACTANTS ON THE SURFACE ABSORPTION OF OXYGEN INTO WATER,
Iowa State Univ., Ames. Dept. of Chemical Engineering; and Iowa State Univ., Ames. Dept. of Nuclear Engineering.
D. D. Lee.
Available from the National Technical Information Service, Springfield, Va 22161, as PB-251 035 $6.00 in paper copy, $2.25 in microfiche. PhD thesis, 1973. 132 p. 33 fig, 4 tab, 37 ref, 2 append. OWRT B-030-IA (2).

Descriptors: *Oxygen, *Surfactants, *Mass transfer, Ice cover, Absorption, Air-water interfaces, Oxygenation, Electrolytes, Diffusion.
Identifiers: Sodium pyrophosphate, Aerosol O.T., Dreft, Bacto-peptone, Glucose oxidase.

To determine the practicality of oxygenating ice-covered lakes and rivers, the effects of surface active agents on the oxygen interfacial mass-transfer coefficient into water were studied. At low turbulence levels in stirred cell reactors, low surface active agent and electrolyte concentrations changed the coefficient; the change was unpredictable as 10-15% increases, no changes, or decreases were observed, apparently due to interfacial turbulence increases resulting from hydrodynamic disturbances caused by small amounts of impurities. Higher surfactant concentrations can form layers, partially reducing interfacial turbulence and mass transfer rates. Eddy diffusion effects at air-water interfaces were observed with an oxygen microprobe. The coefficient's linear dependence on square root of eddy renewal rate in turbulent gas-liquid interfacial mass transfer is shown. Using glucose oxidase as a contaminant, formation of an interfacial stagnant layer which varied in thickness with glucose oxidase concentration, was demonstrated. The coefficient was affected by low surfactant levels; usually the coefficient decreased, but this was impossible to predict. The microprobe technique was promising in determing What happens during interfacial maass transfer at or near the interface. When a surface layer is formed at the interface, the microprobe can approximate the thickness and oxygen profile across it. (Buchanan-Davidson--Wisconsin)
W76-05458

MICRODYNAMICS OF DETRITUS FORMATION AND DECOMPOSITION AND ITS ROLE AS A STABILIZATION INFLUENCE IN FRESHWATER LAKES,
Rensselaer Polytechnic Inst., Troy, N. Y. Fresh Water Inst.
C. W. Boylen, L. S. Clesceri, S. Kobayashi, and R. A. Park.
Report FWI 75-13, December 1975. 26 p. 10 tab, 22 ref. NSF BMS69-01147 A09.

Descriptors: *Microbial degradation, *Detritus, Aquatic plants, Lakes, Vegetation, New York, Phenology, Carbon, Oxygen, Mass transfer, Model studies, Polymers, Productivity, Succession, Organic compounds, Sediments, Phosphorus compounds, Nitrogen compounds.
Identifiers: *Lake George(NY), Deoxyribonucleic acid.

Detritus formation and decomposition microdynamics in Lake George, New York, showed distinctive differences with respect to sloughing and mortality between macrophytes and that of entering allochthonous and autochthonous detritus which is decomposed throughout the winter at rates dependent on temperature and the chemical composition of organic material. There was no association between invertebrate numbers

and macrophyte decomposition rates. Nitrogen and phosphorus release rates were similar to decomposition rates. Functions of a macrophyte submodel include morphological changes influenced by depth, fruiting habits, overwintering productivity, and sediment preference. It can simulate sloughing and die-back in diverse species. Plant structural components gradually decreased from late autumn to spring. Deoxyribonucleic acid levels indicated microbial cycling and succession. Changes in organic polymers and increases in sediment DNA closely paralleled changes in cellulose. There was no increase in dissolved organic carbon, indicating no release of phosphorus or nitrogen to overlying water during active growth periods. The organic content of the particulate load to the lake was high. The importance of detritus in stabilizing seasonal nutrient flux in lake ecosystems is being studied and its role in nutrient levels and biological responses. (Buchanan-Davidson--Wisconsin)
W76-05459

STUDIES ON THE FRESHWATER ALGAE OF THE SUDAN. II. THE DISTRIBUTION OF THE BACILLARIOPHYCEAE OF WADI GALOL, JEBEL MARRA,
Khartoum Univ. (Sudan). Dept. of Botany.
A. G. A. Karim.
Hydrobiologia, Vol. 47, No. 1, p. 31-42, 1975. 6 plates, 18 ref.

Descriptors: *Aquatic algae, *Diatoms, *Africa, Systematics, Periphyton, Distribution, Streams, Habitats, Algae.
Identifiers: Jebel Marra(Sudan), Pennales.

Benthic and planktonic diatoms in the Galol Valley, Jebel Marra, Sudan, were collected and identified. Some diatoms were found growing on filamentous algae or weeds in running water. Epithemia sorex was the most common epiphyte on water weeds. Diatoms are associated with filamentous algae growing in shallow pools left behind when the creeks drained into the perennial stream. It is difficult to distinguish between epiphytic and epipelic periphyton, since habitat exchange between the two is very rapid. Some diatoms were observed among sediments and fallen leaves on the edge of the creeks in association with algae. Epilithic periphyton were associated with algae growing on rock surfaces in the brook. Some were found in open water, and some were occasionally found in phytoplankton of stream and creeks. There were no striking qualitative or quantitative differences in planktonic samples collected from the brook or creeks, but the benthic community of each was more varied. Epiphytic periphyton were the largest community, while the epilithic habitat supported fewer diatoms. Generally green filamentous algae supported more periphyton than filamentous blue-green algae. All diatoms belonged to the Pennales and are illustrated. Biraphidineae predominated in periphyton and Araphidineae in phytoplankton. Findings are compared with those found in other regions. (Buchanan-Davidson--Wisconsin)
W76-05460

PHOSPHORUS QUOTA AND THE CHLOROPHYLL: CARBON RATIO IN MARINE PHYTOPLANKTON,
Dunstaffnage Marine Research Lab., Oban (Scotland).
P. Tett, J. C. Cottrell, D. O. Trew, and B. J. B. Wood.
Limnology and Oceanography, Vol. 20, No. 4, p. 587-603, 1975. 4 fig., 4 tab., 34 ref.

Descriptors: *Equations, *Phosphorus, *Marine algae, *Chlorophyll, *Carbon, *Growth rates, Model studies, Regression analysis, Detritus, Respiration, Photosynthesis, Limiting factors, Eutrophication, Cultures, Europe, Light intensity.
Identifiers: *Loch Creran(Scotland).

Studies of nutrient-limited algal growth permitted derivation of an equation relating algal chlorophyll: carbon ratio to cell nutrient quota. This was tested using phosphorus as the nutrient and phytoplankton during the spring increase in Loch Creran, Scotland. The nutrient quota was the phosphorus: carbon atomic ratio. A regression method was used to estimate detrital phosphorus and carbon to correct total particulate material measurements. Phosphorus was not the only limiting nutrient, so subsistance quota estimates were apparent rather than true. The equation describes the relation between phytoplankton chlorophyll, phosphorus, and carbon contents over two three-four week periods. During the period of phytoplankton increase, the subsistance quota and maximum algal chlorophyll: carbon ratio were estimated as 0.014 atom phosphorus/atom carbon and 0.083 g chlorophyll/g carbon; during the period of decline they were 0.0062 and 0.040, respectively. It should be possible to apply this quantitative model of algal nutrient/growth relationships to mixed species of natural phytoplankton with improved details, although the situation is more complex than was assumed. Computer simulations showed that the model combined with simple models of the relation between light intensity and photosynthesis can explain many environmentally induced changes in growth and chemical composition of algal populations. (Buchanan-Davidson--Wisconsin).
W76-05461

SOME EFFECTS OF PROPIONATE ON THE GROWTH OF RHODOPSEUDOMONAS SPHEROIDES S,
Tokyo Metropolitan Univ. (Japan). Dept. of Biology.
K. Maruyama, and H. Kitamura.
Agricultural and Biological Chemistry, Vol. 39, No. 8, p. 1521-1526, 1975. 1 tab., 5 fig., 21 ref.

Descriptors: *Photosynthetic bacteria, *Growth rates, Carbon, Inhibition, Aerobic conditions, Anaerobic conditions, Light, Metabolism.
Identifiers: *Propionate, *Rhodopseudomonas spheroides S, Glucose, Acetate, Sodium bicarbonate.

Carbon compound utilization is used to classify photosynthetic bacteria. Effects of propionate on Rhodopseudomonas spheriodes S growth were studied in the presence of various carbon compounds. Propionate strongly inhibited Rhodopseudomonas growth in media containing glucose as carbon source under aerobic-dark conditions, but not under anaerobic-light conditions. Inhibition was restored by adding acetate or sodium bicarbonate to the medium, but the mechanism seemed to differ. Pyruvate, acetoin, and acetaldehyde accumulated in the medium during growth inhibition caused by addition of propionate; acetoin and acetaldehyde may be secondary products from pyruvate. The results suggested operation of the methyl-malonyl-CoA or alpha-hydroxyglutarate pathway. Propionate inhibited growth on glucose medium under aerobic-dark conditions, but glucose consumption continued, suggesting that propionate altered the energy flow in growth. Propionate may uncouple biological energy from cell growth or inhibit the metabolic pathway. Bacteria did not grow on sodium bicarbonate medium but with added propionate growth occurred under aerobic-dark conditions, suggesting that not propionate but its intermediate(s) inhibited growth on glucose. When glucose was the carbon source under anaerobic-light conditions, growth was not inhibited as strongly by propionate as when inhibition was aerobic; this may reflect a different metabolic pathway for glucose during aerobic and anaerobic growrh. (Buchanan-Davidson--Wisconsin).
W76-05462

ALGAL NITROGEN FIXATION IN CALIFORNIAN STREAMS: DIEL CYCLES AND NOCTURNAL FIXATION,
California Univ., Berkeley. Div. of Sanitary Engineering.
A. J. Horne.
Freshwater Biology, Vol. 5, No. 5, p. 471-477, 1975. 3 fig., 1 tab., 19 ref.

Descriptors: *Algae, *Nitrogen fixation, *Nocturnal, *Biorhythm, California, Diurnal, Nostoc, Streams, Cyanophyta, Respiration, Photosynthesis.
Identifiers: *Rocky Creek(Calif).

Diurnal nitrogen-fixation by Nostoc during seasonal growth cycle peaks on clear and cloudy days were investigated in Rocky Creek, California. A definite nitrogen-fixation peak was observed during darkness which could not be explained by a tailing of daytime fixation. Maximum nitrogen-fixation rates occurred in the light but fixation also occurred in the dark, with the lowest fixation in the early evening and a steady increase through the night. Dark activity occurred on both clear and rainy days, but was not obvious in Nostoc growing in heavily shaded areas. It is postulated that competition for reductant between nitrogenase and other processes, especially photorespiration, controlled the diel cycle rather than variations in the intracellular nitrogen pool. Because Nostoc is most abundant in unshaded areas and one-third of each day's nitrogen is fixed in the dark, studies should take dark fixation into account. The results suggest that nitrogenfixation in Rocky Creek is an energetically marginal phenomenon, susceptible to demands for reductant by other processes, especially photorespiration. However nitrogen-fixation is nutritionally essential in this nitrogen-depleted environment and occurs when surplus reductant is available, even at night. (Buchanan-Davidson-Wisconsin).
W76-05463

INPUT-OUTPUT MODELS WITH SPECIAL REFERENCE TO THE PHOSPHORUS LOADING CONCEPT IN LIMNOLOGY,
Canada Centre for Inland Waters, Burlington (Ontario).
R. A. Vollenweider.
Schweizerische Zeitschrift fur Hydrologie, Vol. 37, No. 1, p. 53-84, 1975. 7 fig., 24 ref.

Descriptors: *Input-output analysis, *Mathematical models, *Phosphorus, *Eutrophication, Limnology, Balance of nature, Export, Volume, Equations, Estimating, Nitrogen, Depth.
Identifiers: Water residence time, Water renewal time, Mass balance.

Elementary mass balance and export models are described in relation to eutrophication as caused by phosphorus and nitrogen. For mass balance of lakes and mass export from a lake drainage area a continuity of mass equation is used. A linear model for conservative substances had limited application. A model for non-conservative substances permits derivation of the extent of reaction and velocity of movement. Comparisons of relative nitrogen and phosphorus residence times show that with increasing eutrophication nitrogen metabolism increases beyond simple proportionality, thus explaining the transition from phosphorus to nitrogen limitation in eutrophic lakes. The model was modified, incorporating a probability that a particular fraction of water is replaced by new water or that a particular fraction of a dissolved or suspended substance is washed out. A non-linear model shows quantitative and qualitative changes in lake metabolism; the most important change during eutrophication is hypolimnetic oxygen reduction. Criteria for phosphorus loading in relation to the ratio of mean depth: water fill-in-time suggests that lakes having long water renewal times are more sensitive to phosphorus loading than would appear from mean

depth only. An export model defining average concentration of a substance at a particular river transect is being used characterize drainage systems. (Buchanan-Davidson--Wisconsin).
W76-05464

EFFECT OF PHOSPHORUS DEFICIENCY ON TWO ALGAE GROWING IN CHEMOSTATS,
Fisheries and Marine Service, Winnipeg (Manitoba).
F. P. Healey, and L. L. Hendzel.
Journal of Phycology, Vol. 11, No. 3, p. 303-309, 1975. 5 fig., 1 tab., 34 ref.

Descriptors: *Phosphorus, *Deficient elements, *Nutrient requirements, *Algae, Chemical properties, Metabolism, Anabaena, Scenedesmus, Carbohydrates, Cultures, Proteins, Chlorophyll, Lipids.
Identifiers: Nucleic acids, Alkaline phosphatase.

Effects of phosphorus deficiency on composition and metabolism of Anabaena variabilis and Scenedesmus quadricauda were studied in a phosphorus-limited chemostat. There were three patterns of changes as a function of dilution rate. Most aspects of composition changed progressively with dilution rate. Storage carbohydrate content generally increased while cEllular nitrogen phosphorus, protein, nucleic acid, chlorophyll, protein: carbohydrate ratio, and RNA:DNA ratio in S. quadricauda, decreased with increasing deficiency. The second pattern included metabolism changes showing great sensitivity of onset of phosphorus deficiency; alkaline phosphatase activity and the ability to take-up phosphate increased with increasing deficiency at higher dilution rates. In the third pattern, the S. quadricauda decreasing phosphorus and increasing carbohydrate contents with increased phosphorus deficiency were between the first and second patterns. The A. variabilis decreasing nitrogen content was between the first and third. All parameters are potential indicators of nutritional physiology of natural algal populations. The results permit evaluation of indicators relative to characteristics of an ideal bioassay. The metabolic indicators did not increase between moderate-extreme deficiency, but most aspects of composition changed over a broad range of degrees of deficiency. (Buchanan-Davidson--Wisconsin).
W76-05465

SULPHIDE FORMATION AND CHEMICAL COMPOSITION OF BOTTOM SEDIMENTS OF SOME ITALIAN LAKES,
Akademiya Nauk SSSR, Yaroslavl. Institut Biologii Vnutrennykh Vod.
J. I. Sorokin.
Hydrobiologia, Vol. 47, No. 2, p. 231-240, 1975. 1 fig., 4 tab., 15 ref.

Descriptors: *Sulfides, *Sulfates, *Bottom sediments, *Lakes, Chemical properties, Eutrophication, Sulfur bacteria, Reduction(Chemical), Brackish water, Hydrogen sulfide, Oxygen sag, Salinity, Alpine, Europe, Methane bacteria, Anaerobic conditions, Water pollution effects, Meromixis.
Identifiers: *Lago Maggiore(Italy), *Lago Lugano(Italy), Lake Faro(Sicily), Lake Ganzirri(Sicily).

Sulfide formation and sulfate reduction were studied in bottom sediments of the deep subalpine Lakes Maggiore and Lugano. Sediment sulfide accumulations were the highest ever recorded in limnology. Sediment and water sulfate concentrations were very low. Sulfate oxidation to hydrogen sulfide and accumulation of sulfide ions were very rapid. In Lago Lugano, hydrogen sulfide diffused into the water and was quickly oxidized causing an oxygen deficit in the hypolimnion. Sediment sulfide concentrations of the lagoon of Venezia and two brackish Sicilian lakes (Faro and Ganzirri) were 2-3 times less. Organic matter accumulated rapidly in Maggiore and Lugano; organic carbon contents were high. High carbon:nitrogen and low nitrogen:phosphorus ratios indicated nitrogen loss in lake sediments due to reduction to elemental nitrogen. Phosphorus accumulation was high. Methane-producing microflora were found in Lago Maggiore sediment and Thiobacilli, Beggiatoa, and Metallogenium were found in bottom water layers. In Lago Lugano bacterial biomass in sediments was high, and a thick white film of Beggiatoa cell filaments filled with drops of sulfur was found on the sediment surface. Lake stagnation will gradually increase hypolimnetic salt concentration. Hydrogen sulfide accumulation in sediments and formation of an anaerobic zone due to pollution and eutrophication can change these deep lakes to meromictic basins. (Buchanan-Davidson--Wisconsin).
W76-05466

CONTROL OF AQUATIC VEGETATION IN NEW YORK STATE,
New York State Coll. of Agriculture and Life Sciences.
J. Adamec.
Available from the National Technical Information Service, Springfield, Va 22161, as PB-237 207, $4.50 in paper copy, $2.25 in microfiche. NSF-RA-G-73033. Report SS-404, September 1973. 68 p. 63 ref., 1 append.

Descriptors: *Aquatic weed control, *New York, Nutrient removal, Herbicides, Chemcontrol, Copper sulfate, Diquat, Mechanical control, Harvesting, Disposal, Vegetation regrowth, Cost comparisons, Permits, Biocontrol, Fish, Application methods, Management, Legislation, Toxicity.
Identifiers: White amur.

The eutrophication process and the consequent proliferation of aquatic weeds are discussed. Most of the aquatic plant control in New York State is done by application of chemicals, such as copper sulfate and diquat. However, the major disadvantage of chemical control is the cumulative toxicity potential. Although mechanical harvesting is the preferred treatment method, it is utilized on a small scale and only where chemical applications are prohibited. Mechanical harvesting gives immediate relief while not drastically upsetting the ecosystem. Harvesting removes excess nutrients from waters by removing all vegetation including filamentous algae. The various successful harvesting methods are described. While still in the evaluation stage, the white amur (Ctenopharyngodon idella) shows great potential as a weed control agent. The fish has an indescriminate, voracious appetite, it does not compete for food with native fishes, and the possibility that it will spread is slight. It is regarded as an excellent food fish and it also has potential as a sport fish. The application for permit to use chemicals, New York State rules and regulations relating to the use of chemicals, and cost comparison of harvesting and chemical control are contained in the appendices. (Auen-Wisconsin)
W76-05467

RESPONSE OF THE SPOKANE RIVER PERIPHYTON COMMUNITY TO PRIMARY SEWAGE EFFLUENT AND CONTINUED INVESTIGATION OF LONG LAKE,
Eastern Washington State Coll. Cheney. Dept. of Biology.
R. A. Soltero, and A. F. Gasperino.
Washington Department of Ecology, Report 75-15, July 1975. 129 p. 22 fig., 34 tab., 83 ref.

Descriptors: *Reservoirs, *Water pollution effects, *Periphyton, *Rivers, *Benthos, *Diatoms, Sewage effluents, Nitrogen, Dissolved oxygen, Water chemistry, Standing crop, Phosphorus compounds, Nutrients, Eutrophication, Silica, Water temperature, Phytoplankton, Primary productivity, Stratification, Turbulence, Light penetration, Retention, Hydrology, Cores, Organic matter, Varieties, Specific conductivity, Assay, Washington.
Identifiers: *Spokane River(Wash.), *Long Lake(Wash.), Diversity index, Autotrophic index.

Primary sewage effluents from Spokane, Washington, affected benthic diatom abundance in the Spokane River. There were fewer species and the diversity index was less below the outfall. Nitzchia fonticola and N. palea abundance was high due to increased dissolved nitrogen level. Achnanthes was sensitive to dissolved oxygen concentrations. Diatoms abundance correlated significantly with orthophosphate concentrations. A mean autotrophic index increased below the outfall. Based on individual species abundance, mean diversity and autotrophic indices, and percentage similarties between stations, a station 3.2 km downstream was recovering. Long Lake was highly eutrophic and its tributaries showed that Spokane's sewage effluents were major nutrient sources. Inorganic nitrogen and orthophosphate concentrations increased below the outfall. Orthophosphate, nitrate nitrogen, silica, and temperature affected phytoplankton abundance. Seasonal phytoplankton periodicity depended primarily on stratification, turbulence, light penetration, and retention time. Sediment cores indicated that organic matter had stabilized before incorporation into sediments; nitrogen and phosphorus increase 1.4-fold while diatoms increased 7-fold. Sediment accumulation was 24 mm/year. Sediment vertical migration, leaching, and internal phosphorus recycling will not greatly affect the reservoir's trophic status after secondary sewage treatment with phosphorus removal begin. Nutrient loading abatement, high seasonal flushing rates, and preservation of sediment integrity should facilitate Long Lake's recovery. (Buchanan-Davidson--Wisconsin).
W76-05468

MECHANICAL MANAGEMENT OF AQUATIC VEGETATION: ANALYTICAL STUDIES OF UNIT OPERATIONS POTENTIALLY USEFUL IN THEIR PROCESSING,
Wisconsin Univ., Madison. Dept. of Mechanical Engineering.
For primary bibliographic entry see Field 3B.
W76-05469

A PRELIMINARY REPORT ON THE CONEWAGO CREEK FAUNAL SURVEY, LANCASTER COUNTY, PENNSYLVANIA,
York Coll., Pa.
J. W. Stambaugh, and R. B. Denoncourt.
Proceedings Pennsylvania Academy of Science, Vol. 48, p. 55-60, 1974. 2 fig., 3 tab., 3 ref.

Descriptors: *Invertebrates, *Baseline studies, *Streams, *Fish, *Benthic fauna, Pennsylvania, Surveys, Water temperature, Physical properties, Hydrogen ion concentration, Varieties.
Identifiers: *Conewago Creek(Penn.), Species diversity index.

Baseline data on fish and macroinvertebrates was collected at ConewagCreek, Pennsylvania, to determine the extent of impact that may be imposed on the stream by proposed urban land development. Thirty-three species of fish (2029 specimens) were collected from July 1972-November 1973. The most common species found at all collecting stations were Notropis spilopterus, N. procne, Lepomis auritus, N. hudsonius, N. cornutus, N. amoenus, Etheostoma olmstedi, Nocomis micropogon, Catostomus commersone, and Pimephales, notatus. A total of 27 taxa of benthic macroinvertebrates were found; in numerical order, the most predominant were Hydropsyche, Baetidae, Heptageniidae, Periodidae, Orconectes, Zygoptera, Corixidae, Elmidae, Tipulidae, and Tendipedidae. The means and ranges of the species diversity indices for macroinvertebrates showed no obvious trends. Indices for fish showed a decreasing trend from up-

stream to downstream sites. A comparison of diversity indices for fishes and macroinvertebrates suggests less stability for fishes. The macroinvertebrate species diversity indices at all stations on Conewago Creek indicated moderate pollution. Water and air temperatures, oxygen and carbon dioxide concentrations, hydrogen ion concentration, and hardness were also recorded. (Buchanan-Davidson-Wisconsin).
W76-05470

PRIMARY PRODUCTION STUDIES ON A NEW RESERVOIR: BIGHORN LAKE-YELLOWTAIL DAM, MONTANA, U.S.A.,
Eastern Washington State Coll., Cheney. Dept. of Biology.
R. A. Soltero, and J. C. Wright.
Freshwater Biology, Vol. 5, No. 5, p. 407-421, 1975. 6 fig., 5 tab., 41 ref.

Descriptors: *Primary productivity, *Water chemistry, *Reservoirs, *Limnology, Montana, Nitrogen, Water temperature, Phosphates, Specific conductivity, Phytoplankton, Diatoms, Standing crops, Cyanophyta, Dinoflagellates, Chlorophyll, Euphotic zone, Light penetration.
Identifiers: *Bighorn Lake(Mont.), *Yellowtail Dam(Mont.), Bacillariophyceae.

Limnological studies of the newly impounded Bighorn Lake were conducted during 1968 to 1970 to determine if a decline would occur in primary productivity and to relate changes in primary production to the physical and chemical environment. Total inorganic nitrogen (primarily nitrate nitrogen), orthophosphate, iron, manganese, and zinc were kusually higher at the influx of the Bighorn and Shoshone Rivers. Bacillariophyceae were the dominant class of phytoplankton. Algal succession was the same all three years with a large part of the diatom standing crop in the spring and early summer, followed by flagellates, blue-green algae, and another diatom maxima in the fall. Chlorophyll concentrations followed phytoplankton volumes. Volume-based phytoplankton density and chlorophyll concentration decreased down-reservoir. The euphotic zone depth increased down-reservoir as silt settled out, consequently euphotic zone standing crops were greatest at mid-reservoir. Insufficient light penetration was the principal limiting factor to primary production in the upper reservoir. Decreased primary production in the lower reservoir did not seem to be due to nutrient limitation. Bighorn Lake was classified as moderately productive. Comparison of sampling periods showed that the estimated net primary production increased 84%, mean total phytoplankton standing crop 44%, and mean chlorophyll concentration 49% in 1970 over 1968. (Buchanan-Davidson--Wisconsin).
W76-05471

UTILIZATION OF ALGAL ASSAYS TO ASSESS THE EFFECTS OF MUNICIPAL, INDUSTRIAL, AND AGRICULTURAL WASTEWATER EFFLUENTS UPON PHYTOPLANKTON PRODUCTION IN THE SNAKE RIVER SYSTEM,
Pacific Northwest Environmental Research Lab., Corvallis, Oreg.
J. C. Greene, W. E. Miller, T. Shiroyama, and T. E. Maloney.
Water, Air, and Soil Pollution, Vol. 4, No. 3-4, p. 415-434, 1975. 11 fig., 3 tab., 9 ref.

Descriptors: *Bioassay, *Water pollution effects, *Waste water(Pollution), *Rivers, *Phytoplankton, *Eutrophication, Trophic level, Inhibition, Washington, Oregon, Idaho, Nitrogen, Phosphorus, Productivity, Pacific Northwest U.S., Nutrients, Toxins, Sampling, Forecasting, Limiting factors.
Identifiers: *Algal assay procedure, *Snake River (Northwest U.S.), Selenastrum capricornutum.

Excessive aquatic growth and algal blooms are the most characteristic water quality problems in the Snake River Basin in Washington, Oregon, and Idaho. Correlation was high between expected trophic state and algal assay productivity response. No correlation was observed between increase of calcium, magnesium, alkalinity, and carbon content with maximum Selenastrum capricornutum yield. Phosphorus was growth-limiting in 45% of the samples and nitrogen in 33%. Phosphorus limitation decreased with increased productivity, therefore river waters with high orthophosphorus concentrations are more likely to become algal growth limited by nitrogen or other essential nutrient. In the presence of other essential elements, absence of toxicants, and not less than 0.010 mg orthophosphorus/1, each 0.001 mg orthophosphorus/1 will yield 0.430 mg dry wt S. capricornutum/1. In the presence of other essential nutrients and absence of toxicants, 0.001 mg total soluble inorganic nitrogen/1 will yield 0.038 mg/dry weight S. capricornutum/1. High correlation between predicted and actual yields was found in samples limited for algal growth by phosphorus or nitrogen. Coefficients plus nutrient additions to samples can be used to check accuracy of nitrogen and phosphorus analyses. Same samples inhibited yields during log phase of growth indicating presence of toxicants. Sampling techniques are discussed. (Buchanan-Davidson--Wisconsin).
W76-05472

UPTAKE OF ZINC AND STRONTIUM BY BROWN ALGAE,
Trondheim Univ. (Norway). Inst. of Marine Biochemistry.
O. Skipnes, T. Roald, and A. Haug.
Physiologia Plantarum, Vol. 34, No. 4, p. 314-320, 1975. 9 fig., 1 tab., 11 ref.

Descriptors: *Phaeophyta, *Zinc, *Absorption, *Strontium, Marine algae, Cations, Cytological studies, Plant physiology, Radioisotopes, Algae.
Identifiers: *Ascophyllum nodosum, Desorbtion.

Accumulation of radioactively-labelled strontium and zinc in living and killed tips of the brown alga Ascophyllum nodosum was studied. Strontium accumulation was reversible, rapid and similar in living and killed plants. Therefore brown algae might be used to indicate pollution with strontium isotopes. A small part of zinc uptake by living algae and strontium accumulation by both living and dead algae seemed due to an ion-exchange process with intercellular polysaccharides. Zinc uptake by living algae was constant, slow, irreversible, and persisted for a long time. Uptake by dead algae was rapid and reversible, indicating that zinc-binding substances were not directly accessible to zinc in seawater before killing. In living plants, these substances may be in membrane-surrounded structures which regulate zinc uptake by living cells but are destroyed when algae are killed, making zinc-binding substances accessible. Zinc transfer from reversible intercellular sites to irreversible sites continued undistured during low-tide periods. Intercellular charged polysaccharides functioned as ion buffers, allowing ion uptake into cells at a constant rate, independent of tides. Zinc mainly accumulated near the surface of living A. nodosum tips. The nature of zinc-binding substances is unknown. Polyphenols in vacuoles may have high selectivity for many transition elements compared to major sea-water cations. (Buchanan-Davidson--Wisconsin).
W76-05473

SOME PHYSICAL FACTORS AS THE ECOLOGICAL BACKGROUND IN THE PELAGIAL OF THE SOSNOWICKIE LAKES,
Warsaw Univ. (Poland). Zaklad Microbiologica Wody Sci.
K. Matusiak, and I. Wojciechowski.
Acta Hydrobiologica, Vol. 17, No. 2, p. 102-139, 1975. 16 fig, 8 tab, 29 ref.

Descriptors: *Lake morphology, *Trophic level, Oxygenation, Dystrophy, Light intensity, Light penetration, Thermal stratification, Irradiation, Color, Deep water, Europe, Lakes.
Identifiers: *Poland, Lake Biale Sosnowickie(Poland), Lake Bialskie(Poland), Lake Czarne Sosnowickie(Poland).

Temperature, oxygen, and light studies of Lakes Biale Sosnowickie, Bialskie, and Czarne Sosnowickie in the Leczynssko-Wlodawskie Lake District, Poland, from 1961-1966 showed that these lakes differed from other Polish lakes, principally because of their high potential fertility with gradually increasing dystrophy. Thermal stratification was observed in the summer: Lakes Bialskie and Czarne were holomictic (dimictic) and Lake Biale polymictic. In Lake Biale there were frequently large changes in oxygen; however the lower layers always contained less oxygen and upper and middle layers were often oxygen supersaturaged. Hypolimnetic waters of Lakes Bialskie and Czarne were only oxygenated during spring and autumn. The vertical oxygen content corresponded to the thermal stratification. Hydrogen sulfide was detected occasionally. Transparency and light transmission were highest in Lake Bialskie and lowest in Lake Biale Sosnowickie. Lake Bialskie's euphotic zone was thickest; it was usually shallower in Lake Biale. Correlations between water transparency, water transmission, and compensation depth under ice-snow cover depended on snow thickness and qualitative state. Surface irradiation values and water color were also noted. In 1964, Wieprz-Krzna Canals lowered groundwater levels, dried up peat bogs, limited inflow of humus materials into the lakes, and inhibited dystrophication. (Buchanan-Davidson--Wisconsin).
W76-05474

DISTRIBUTION OF METALS IN LAKE SEDIMENTS OF THE ADIRONDACK REGION OF NEW YORK STATE,
Rensselaer Polytechnic Inst., Troy, N.Y. Fresh Water Inst.
S. L. Williams, D. B. Aulenbach, and N. L. Clesceri.
FWI Report 75-11, 1975. 16 p, 1 fig., 4 tab., 9 ref.

Descriptors: *Lake sediments, *Metals, *Distribution, New York, Cadmium, Chromium, Cobalt, Copper, Nickel, Zinc, Cores, Lithification, Watersheds(Basins), Lake morphology, Trophic level, Surface waters, Hardness(Water), Water pollution.
Identifiers: Ticonderoga Bay(NY), Saratoga Lake(NY), Lake Champlain(NY), Lake George(NY), Crystal Lake(NY), Second Lake(NY), Lake of the Pines(NY), Bass Lake(NY).

To correlate metal concentrations in sediments with lake parameters, cadmium, cobalt, chromium, copper, nickel, and zinc were determined in several levels of sediment cores and the overlying water of seven lakes and Ticonderoga Bay in the vicinity of Adirondack Park in upper New York State. Metal concentration differences were evaluated in respect to location in the cores, drainage basins lithology, geographic location, and trophic state. Each parameter had an effect on one or more of the metals in the sediments. Although there is generally no direct relation between metals and the lake's trophic state, there seemed to be a relation between specific metals and the trophic states. Results indicated that hardness was important. Cadmium, cobalt, and chromium showed a general increase with trophic state, ranging from oligotrophic to eutrophic. Zinc, with the exception of Ticonderoga Bay, showed lower concentrations. Except for Ticonderoga Bay, copper and nickel concentrations showed no definite trends. Areas like Ticonderoga Bay, which is polluted by industrial wastes, may show varying metal concentrations in overlying waters and sediments, depending on metals discharged in wastes. Sediment

surfaces generally had higher concentrations of all metals than sediments about 0.5 m deep, suggesting sedimentation of metals increased over the years. (Buchanan-Davidson--Wisconsin).
W76-05475

ANALYSIS OF SULFUR-CONTAINING PRODUCTS ACCUMULATED BY CHLORELLA MUTANTS,
Leningrad State Univ. (USSR). Inst. of Nuclear Physics.
I. E. Kamchatova, L. M. Gracheva, K. V. Kvitko, V. G. Korolev, and B. T. Mukhmadiev.
Soviet Plant Physiology, Vol. 22, No. 1, p. 120-124, 1975. 2 fig, 1 tab, 11 ref.

Descriptors: *Cytological studies, *Sulfur, *Absorption, *Sulfur compounds, *Chlorella, Kinetics, Peptides, Cultures, Microbiology, Separation techniques, Amino acids.
Identifiers: Autolysis, Cysteine, Cysteic acid, Cysteine sulfinic acid.

The kinetics of sulfur disappearance from the culture medium and the presence of sulfur in cells of a wild strain of Chlorella vulgaris and 'feeder' mutants obtained from this strain by X-ray irradiation were studied, using sulfur-35 as a label. The sulfur-containing products which were accumulated by these strains were compared by paper chromatographic methods. The best solvents for separation of sulfur-containing compounds were determined. Cells of mutant strains accumulated greater amounts of cysteine than cells of the wild strain. Radioactive sulfur was detected in peptides and proteins of the autolysate of cells of the wild strain. In autolysates of cells of the mutant strains, cysteine, cysteic acid, and cysteine sulfinic acid were also detected. Cysteine accumulated primarily in the form of low molecular weight peptides. It is hypothesized that mutation injured the regulation of cysteine synthesis. Cysteine accumulated and perhaps combined with other amino acids to form peptides by a pathway not mediated by synthesis on ribosomes. These peptides may stimulate synthesis of excess cysteine and incorporation of cysteine into peptides. A hypothesis is presented to explain the mechanism that determines the 'feeder' trait. The pathways for the microbiological synthesis of sulfur-35 labelled cysteine and other sulfur-containing compounds are discussed. (Buchanan-Davidson--Wisconsin)
W76-05476

DIFFUSION OF MINERAL IONS THROUGH THE WALL OF NITELLA CELLS,
Moscow State Univ. (USSR). Faculty of Biology and Soil.
B. N. Ivanov, G. A. Kurella, and L. G. Yaglova.
Soviet Plant Physiology, Vol. 22, No. 1, p. 102-106, 1975. 3 tab, 10 ref.

Descriptors: *Electrolytes, *Salts, *Cytological studies, *Algae, Cations, Anions, Diffusion, Permeability, Selectivity.
Identifiers: *Nitella flexilis, Potassium chloride, Sodium chloride, Lithium chloride, Ammonium chloride, Hydrochloric acid, Potassium nitrate, Potassium bicarbonate, Potassium dihydrogen phosphate, Potassium sulfate.

Membrane properties exhibited by isolated Nitella flexilis cell walls under conditions of increasing electrolyte concentration gradients through the wall were studied. Also the dependence of cell wall membrane properties on the nature of cations and anions and specific characteristics of diffusion of separate ions through the wall were measured using 0.1-0.0001 N solutions of potassium chloride, sodium chloride, lithium chloride, ammonium chloride, hydrochloric acid, potassium nitrate, potassium bicarbonate, potassium dihydrogen phosphate, and potassium sulfate. Selective permeability of walls for cations was weakly dependent on the nature of univalent ions and cations of the alkaline metals and ammonium. Cell wall selectivity was higher when bivalent anions were present in solutions of potassium sulfate; this was apparently determined by the low permeability of bivalent anions. Ratios of wall permeability coefficients for anions and cations and ratios of wall permeability coefficients for like ions calculated from concentration potential values indicated that differences in wall permeability for univalent ions under various conditions were influenced strongly under conditions of a considerable electrolyte concentration gradient by positive osmotic flux of water, electroosmotic flux of water, and structure and solvating capacity of water in the wall phase for onions). (Buchanan-Davidson-Wisconsin).
W76-05477

THE RELATIONSHIP BETWEEN SUBSTRATE CONTENT, WATER QUALITY, ACTINOMYCETES, AND MUSTY ODORS IN THE BROAD RIVER BASIN,
Environmental Protection Agency, Athens, Ga. Surveillance and Analysis Div.
R. L. Raschke.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-227 063, $5.00 in paper copy, $2.25 in microfiche. Report 03078, January 1973. 82 p. 20 fig, 25 tab, 27 ref.

Descriptors: *Municipal water, *Potable water, *Actinomycetes, *Water pollution effects, *Odor, Rivers, South Carolina, Nutrients, Spring, Organic matter, Air temperature, Water temperature, Rainfall, Streamflow, Runoff, Water treatment, Leaves, Industrial wastes, Municipal wastes, Textiles, Taste, Bottom sediments.
Identifiers: *Broad River(S. C.), Columbia(S. C.), Leaf litter.

Musty odors caused by actinomycetes are common in the Broad River, the water supply for Columbia, South Carolina. Actinomycete growth and odor appear dependent on influx and storage of organic matter and other nutrients, air and water temperature, rainfall, and streamflow during the spring. The major tributaries are the primary source of organic matter and other nutrients; canals and reservoirs act as nutrient sinks and provided substrates conducive to Actinomycete growth and odor production. Leaf litter odors were higher than water odors and increased as leaf litter wet weight decreased. Average stream substrate and leaf litter actinomycete counts increased during the study period. Leaf litter actinomycete counts were generally higher than in stream substrates and periphyton. It is suggested that a n odor panel should be established to sample odors upstream near Parr Dam in the spring. Water should promptly be treated with activated carbon when air and water temperatures of 17C or above occur during extended spring lowflow periods and upstream threshold odors are four or greater (conditions which can cause severe odor problems). Municipal and industrial waste inputs should be reduced as much as possible, especially from Lockhardt and Carlisle textile mills and discharge into tributary streams draining the Greenville-Spartansburg area. (Buchanan-Davidson--Wisconsin)
W76-05478

LIGHT-INDUCED TRANSFORMATIONS OF THE PIGMENT COMPLEX IN ANACYSTIS NIDULANS,
Akademiya Nauk SSSR, Moscow. Institut Biokhimii.
L. M. Vorobeva, A. A. Krasnovskii, and G. A. Kayupova.
Soviet Plant Physiology, Vol. 22, No. 1, p. 9-17, 1975. 8 fig, 25 ref.

Descriptors: *Phototropism, *Light, *Plant pigments, *Cyanophyta, *Chlorophyll, Algae, Photosynthesis, Fluorescence, Plant physiology, Oxygen, Wavelengths, Energy transfer.
Identifiers: Anacystis nidulans, Phycocyan.

Properties of different chlorophyll forms in the pigment complex of photosynthesizing organisms were studied by measuring spectral changes in Anacystis nidulans with growth time and light after cell breakdown. Spectra at -196C of one-day cells grown with low light showed 720 nm fluorescence maximum, low at 685 nm and 695 nm, and maximum phycocyan near 655 nm. After prolonged growth, the main maximum was at 685 nm and at 720 nm fluorescence was low. When one-day cells were illuminated at 30 C, maxima at 695 nm and 720 nm decreased and at 685 nm increased. Prolonged illumination caused chlorophyll fluorescence to decrease and shift from 685 nm to 675 nm due to photodestruction. Phycocyan fluorescence increased due to uncoupling of energy transfer to chloroplasts. In cells grown a long time, the 685 nm maximum did not increase following illumination. Light caused a decrease of fluorescence at 685 nm, and phycocyan fluorescence to increase after prolonged illumination. Without oxygen, long illumination was needed before spectral changes were observed; fluorescence at 695 nm and 685 nm did not decrease. Illuminating cells in air at 15 C, and subsequent dark storage at 30 C, indicated a photochemical reaction with oxygen and a reverse dark reaction which increased the short-wave form. Spectral changes during illumination of algae are due to changes in the pigment complex associated with reversible photooxidation of chlorophyll. (Buchanan-Davidson--Wisconsin).
W76-05479

ROLE OF CALCIUM CARBONATE PRECIPITATION IN LAKE METABOLISM,
Michigan State Univ., East Lansing. Dept. of Botany.
For primary bibliographic entry see Field 2H.
W76-05480

5D. Waste Treatment Processes

ELECTROCHEMICAL REMOVAL OF FLUORIDE ION FROM AQUEOUS MEDIA,
Andco Inc., Buffalo, N.Y. (assignee)
S. K. Lee.
U.S. Patent No. 3,926,753, 5 p, 5 fig, 5 ref; Official Gazette of the United States Patent Office, Vol 941, No 3, p 1318, December 16, 1975.

Descriptors: *Patents, *Waste water treatment, *Industrial water, *Water pollution control, *Ion exchange, Electrochemistry, Anodes, Cathodes, Separation techniques, *Fluorides, Aluminum.

The invention is applicable to the treatment of various liquids containing aluminum-precipitatable, co-precipitatable or complex-forming impurities or toxicants, such as those liquids resulting from industrial metal finishing, chromate conversion coatings, chemical industries, paper mill effluents, sanitary and municipal sewage, aluminum manufacturing, etc. Brackish waters containing high fluoride and other toxic ions may also be treated by this method but primarily it is useful for removal of harmful ions such as fluorides. The method electrochemically removes from an ionizing medium a contaminant fluoride ion which is capable of forming an insoluble aluminum compound, complex or co-precipitate. An electric current is passed between an anode which has a surface or a portion of a surface of aluminum, aluminum alloy or insoluble aluminum compound, and a cathode through the ionizing medium containing the ion to be removed, so as to produce anodically an insoluble aluminum compound, species or complex while cathodically reacting with the aqueous medium to generate hydrogen and produce hydroxyl ion to form insoluble products. Such insoluble materials are recovered from the aqueous medium. (Sinha-OEIS)
W76-05023

ELECTROCHEMICAL CONTAMINANT REMOVAL FROM AQUEOUS MEDIA,
Andco Inc., Buffalo, N.Y. (assignee)
S. K. Lee.
U.S. Patent No. 3,926,754, 9 p, 7 fig, 4 tab, 6 ref; Official Gazette of the United States Patent Office, Vol 941, No 3, p 1318, December 16, 1975.

Descriptors: *Patents, *Waste water treatment, *Industrial wastes, Water pollution control, Separation techniques, *Electrochemistry, Anodes, Cathodes, Iron, *Iron compounds, Chromium, *Ions, Aqueous solutions.
Identifiers: Cyanides.

A method for electrochemically removing from an ionizing medium a contaminant ion which is capable of forming an insoluble iron compound, complex or co-precipitate comprises passing an electric current between an anode which has a surface or a portion of a surface of iron, iron alloy or insoluble iron compound, and a cathode, through the ionizing medium containing the ion to be removed. An insoluble iron compound, species or complex is produced while cathodically reacting with the contaminant ion, to form insoluble products, and removing such insoluble materials from the aqueous medium, or the contaminant, which is initially toxic, is converted to non-toxic or less toxic form which is insoluble and is removed. The invention is applicable to the treatment of various liquids containing iron-precipitatable, co-precipitatable or complex-forming impurities or toxicants, such as those liquids resulting from cooling tower operations, chromate conversion coatings, metal finishing industries, paper mill effluents, sanitary and municipal sewage, etc. Brackish waters may also be treated by this method but primarily it is useful for removal of toxicants such as hexavalent chromium, cyanide and other such materials from waste streams so as to avoid contamination of the waters into which such discharges ultimately flow. (Sinha-OEIS)
W76-05024

PROCESS FOR RECOVERING TIN SALTS FROM THE WASTE RINSE WATER OF A HALOGEN TIN PLATING PROCESS,
Pitt Metals and Chemicals, Inc., Pittsburgh, Pa. (assignee)
R. E. Horn, and D. W. Grenda.
U.S. Patent No. 3,926,759, 6 p, 3 fig, 2 tab, 6 ref; Official Gazette of the United States Patent Office, Vol 941, No 3, p 1319-1320, December 16, 1975.

Descriptors: *Patents, *Waste water treatment, *Industrial wastes, Water pollution control, *Fluorides, Filtration, Separation techniques, Ion transport, *Electrodialysis, Reverse osmosis, Membranes, Metals, Salts.
Identifiers: *Tin-plating industry wastes, Metal recovery, Tin salts.

A process for recovering the tin and fluoride units from waste rinse water in an approximate concentration and ratio suitable for use in a halogen plating bath includes first filtering the waste rinse water to remove insoluble materials and then treating the filtered rinse water to remove residual organic compounds. The treated rinse water is then introduced into a depletion compartment of an electrodialytic cell where the excess fluorides are removed by migrating through an anionic membrane into an adjacent compartment. When a sufficient amount of the fluoride units have been removed from the rinse water by electrodialysis so that the mole ratio of fluoride to tin is suitable for use in a plating bath the rectified rinse water is removed from the electrodialytic cell and is concentrated by electrodialysis or reverse osmosis to form a solution having the approximate concentration of the plating bath. The fluorides are removed from the compartment adjacent the depletion compartment and are reacted with sodium hydroxide to form a bifluoride for use in the rinse water. With this arrangement the tin and fluoride salts are recovered from the rinse water and utilized in the tin plating bath and the fluoride units are also used as a bifluoride in the rinse water. The depleted water is drawn off for reuse. (Sinha-OEIS)
W76-05025

WARM SLUDGE DIGESTION WITH OXYGEN,
Union Carbide Corp., New York. (assignee)
N. P. Wahidieck.
U.S. Patent No. 3,926,794, 13 p, 17 fig, 5 ref; Official Gazette of the United States Patent Office, Vol 941, No 3, p 1330, December 16, 1975.

Descriptors: *Patents, *Waste water treatment, Water pollution control, *Sludge treatment, *Biochemical oxygen demand, *Activated sludge, *Aeration, Oxygen, *Sludge digestion, Mixing, Heating.

A method is disclosed for BOD-removal from wastewater in a covered aeration zone and activated sludge digestion in a covered digestion zone by aeration with oxygen gas. First gas comprising at least 40% oxygen is introduced into the covered aeration zone where it forms gas which is mixed with the wastewater and recycled sludge in the covered aeration zone and one of the fluids in such zone is simultaneously, continuously recirculated against the other fluid in sufficient quantity and rate to maintain the dissolved oxygen content of the mixed liquor. The mixed liquor is separated into purified liquid and activated sludge, and unconsumed oxygen-containing gas is discharged from the aeration zone at rate such that its oxygen content is no more than 40% of the total oxygen introduced to the digestion zone. Part of the activated sludge is then returned to the aeration zone as recycled sludge. Second gas comprising at least 80% oxygen and sufficient in quantity to provide part of the first gas is introduced along with the unreturned activated sludge to the enclosed digestion zone. They are mixed and one of the fluids simultaneously recirculated against the other fluid in the digestion zone. During this step, the sludge is maintained at temperatures of at least 25 deg C and at least 10 deg C warmer than the wastewater aeration zone liquor temperature, but below 75 deg C. The digestion zone mixing and fluid recirculation are continued for sufficient duration to oxidize at least 60% of the biodegradable volatile suspended solids content of the sludge introduced to the digestion zone. (Sinha-OEIS)
W76-05026

BIOLOGICAL TREATMENT OF PLANT WASTE STREAMS TO REMOVE CYANURIC ACID,
FMC Corporation, Philadelphia, Pa. (Assignee).
J. Saldick.
U.S. Patent No. 3,926,795, 6 p, 1 fig, 2 tab, 2 ref; Official Gazette of the United States Patent Office, Vol 941, No 3, p 1331, December 16, 1975.

Descriptors: *Patents, *Waste water treatment, *Sewage treatment, Domestic wastes, *Industrial wastes, Water pollution treatment, Water pollution control, Anaerobic conditions, Hydrolysis, Temperature, Chlorine, Ammonia, Carbon dioxide, Activated sludge, Hydrogen ion concentration, *Biological treatment.
Identifiers: *Cyanuric acid removal.

Cyanuric acid, present along with chlorides and sulfates in aqueous effluents from cyanuric acid chlorinated cyanuric acid processes can be broken down by hydrolysis into C02 and ammonia by treatment with bacteria derived from raw sewage, activated sludges from sewage plants, natural waters or soils, at temperatures below 50 deg C, provided that anaerobic or close to anaerobic conditions prevail in at least a portion of the biomass in the system, nutrient for the bacteria is fed to the system, and the system is maintained at a pH close to neutral (about 5.0 to 8.5). After breakdown of the cyanuric acid to C02 and ammonia, the system can be nitrified with air in known manner, biologically denitrified in known manner, then oxidized with air to remove its residual biological oxygen demand, clarified and discharged. The sludge from the system can then be used as source of bacteria in the primary hydrolysis. (Sinha-OEIS)
W76-05027

PREPARATION OF ACTIVATED SLUDGE AND TREATMENT OF WASTE WATER THEREWITH,
Nippon Gohsei Kagaku Kogyo Kabushiki Kaisha, Osaka (Japan). (Assignee).
Y. Fujita, I. Kawasaki, and N. Hideo.
U.S. Patent No. 3,926,796, 6 p, 1 tab, 4 ref; Official Gazette of the United States Patent Office, Vol 941, No 3, p 1331, December 16, 1975.

Descriptors: *Patents, *Waste water treatment, *Industrial wastes, Water pollution treatment, Water pollution control, Organic compounds, *Activated sludge, *Chemical oxygen demand, Water pollution sources, Resins, *Decomposing organic matter.
Identifiers: *Polyvinyl alcohol resins decomposition.

Although activated sludge can assimilate polyvinyl alcohol resins, the rate of assimilation is very slow. This invention describes a process for preparing activated sludge so that it will decompose polyvinyl alcohol more efficiently. The acclimation of an ordinary activated sludge is carried out in an aqueous solution including a polyvinyl alcohol resin and at least one nutrient in the range of bio-chemical oxygen demand. When a comparatively low activity is sufficient for the activated sludge to treat a waste water, the acclimation is carried out under a low loading of the polyvinyl alcohol resin and completed at the time the COD of the aqueous solution decreases to less than 15% of the initial one. When the high activity is desired, the acclimation is carried out stepwise by increasing stepwise the amount of polyvinyl alcohol resin from less amount to more amount within the above-mentioned range every 85% or more drop of the COD of the aqueous solution. COD is determined by potassium permanganate method. The activated sludge employed in the invention is not limited. Any known activated sludge used in sewage treatment plant or waste water treatments from textile plant, chemical plant and food plant can be employed. Nutrients employed are potassium acetate, sodium acetate, or ammonium acetate in a mixture or alone. (Sinha-OEIS)
W76-05028

REVERSE OSMOSIS MEMBRANE,
Department of the Interior, Washington, D.C. Office of the Secretary.
For primary bibliographic entry see Field 3A.
W76-05029

METHYLENE PHOSPHONATES OF GLYCIDYL REACTED POLYALKYLENE POLYAMINES AND USE IN SCALE AND CHELATION,
Petrolite Corp., St. Louis, Mo. (Assignee).
For primary bibliographic entry see Field 5F.
W76-05030

METHOD FOR REMOVING BOTH ORGANIC MATTER AND BACTERIA FROM A BODY OF WATER,
Water Science, Inc., Calif. (Assignee).
For primary bibliographic entry see Field 5F.
W76-05031

CYANIDE ENHANCEMENT OF THE PHOTOOXIDATION OF ACETIC ACID,
Dow Chemical U.S.A., Midland, Mich. (Assignee).
C. B. Murchison.
U.S. Patent No. 3,926,803, 3 p, 2 tab, 2 ref; Official Gazette of the United States Patent Office, Vol 941, No. 3, p 1332-1333, December 16, 1975.

Descriptors: *Patents, *Waste water treatment, Water pollution control, *Industrial wastes, Separation techniques, Ionization, Ions, Oxidation, Chemical reactions, Aqueous solutions.
Identifiers: *Photooxidation, *Cyanide ions, Ferric ions, *Acetic acid.

Aqueous solutions containing oxidizable carboxylic acids such as waste streams which come from chemical plants, distilleries, smelters, sewage systems and the like can be treated to oxidize the organics contained in them and correspondingly reduce the chemical, biochemical and total oxygen demand of the liquor. The process can be used in conjunction with other known waste treatment processes if desired. The process is more efficient when substantially all the reactants are dissolved in the aqueous liquor. However, some solid organics can be oxidized by the process. Classes of organic materials the photooxidation of which is further catalyzed by the addition of cyanide ions include aliphatic and aromatic carboxylic acids, e.g. formic, acetic, propionic, 2,4-dichlorophenoxyacetic, chloropropionic, glycolic, chloroacetic, lactic, butyric acids and the like. Acetic acid is particularly beneficially oxidized by this method. To an aqueous solution containing one or more carboxylic acids and a catalytic quantity of ferric ions is added an amount of cyanide ions sufficient to provide a mole ratio of cyanide ions to ferric ions in the solution of at least about 5:1. The solution is maintained at pH of 4 or less, treated with 02, and subjected to light waves ranging in length from about 2000 A to about 5800 A. As a result C02 is released and the total organic carbon (TOC) level of the solution is reduced. (Sinha-OEIS)
W76-05032

DEVICE FOR THE CONTINUOUS TREATMENT OF LIQUID STREAMS,
Gesellschaft zur Wiederaufarbeitung von Kernbrennstoffen m.b.H., Leopoldshafen bei Karlsruhe (West Germany).
H. Evers, and W. Knoch.
U.S. Patent No. 3,926,807, 7 p, 3 fig, 8 ref; Official Gazette of the United States Patent Office, Vol 941, No 3, p 1333, December 16, 1975.

Descriptors: *Patents, *Waste water treatment, *Water treatment, *Demineralization, *Water softening, *Ion exchange, Water purification, Separation techniques, Sorption, Nuclear wastes, Byproducts, Beneficial use, Equipment.

Continuous treatment of a liquid stream is achieved by circulation with solids in a countercurrent flow. The device can be used both for cleaning of liquids, irrespective of the state of aggregation of the impurities contained in it, and for the generation of valuable substances from liquids irrespective of the form in which such valuable substances are present in such liquids. At the same time, the device can be used both for ion exchange processes with ion exchange material circulation and for sorption-desorption processes and enrichment and/or separation processes, respectively. The device which treats a liquid stream with solids circulated from top to bottom in a treatment column in countercurrent flow to the liquid stream comprises of: a treatment column with heating and cooling jacket; a first counter-pressure chamber connected to the bottom of the treatment column for receiving washed and loaded solids from the treatment column; a regeneration column for regenerating the solids used in the treatment column; a second counterpressure chamber connected to the bottom of the regeneration column for receiving regenerated solids from the regeneration column; a first valveless connection line connecting the outlet for regenerated solids at the bottom end of the counterpressure chamber of the regeneration column with the inlet for solids at the top of the treatment column; and a second valveless connection line connecting the outlet for removing solids at the bottom end of the counterpressure chamber of the treatment column with the inlet for the loaded and washed solids at the top of the regeneration column. (Sinha-OEIS)
W76-05033

SEWAGE TREATMENT SYSTEM,
C. C. Goddard.
U.S. Patent No. 3,926,808, 3 p, 6 fig, 9 ref; Official Gazette of the United States Patent Office, Vol 941, No 3, p 1334, December 16, 1975.

Descriptors: *Patents, *Waste water treatment, *Sewage treatment, Water pollution control, *Aeration, *Aerobic bacteria, Solar radiation, Water reuse, Irrigation water, Reclaimed water.

This sewage treatment system proposes oxidation through aeration, aerobic bacterial action on nutritional matter and the natural effects of ultraviolet rays emitted by the sun. Raw sewage effluent is released into recirculation aeration channels with impervious linings and is seeded with aerobic bacteria. Part of the effluent is diverted to a recirculating sump from which it is pumped through a venturi tube asperating device thus adding air to the incoming sewage. In addition it is seeded with aerobic bacteria and diluted with clarified water from the final effluent aeration channel. The effluent passes over a wier protected by a scum skimmer, through a discharge trough, either to natural drainage or into a collecting tank reservoir for use in irrigation or lawn sprinkler operation. Fresh water may be injected into the system, preferably at the recirculation sump, if the sewage effluent is insufficient to provide for necessary intermittent irrigation. (Sinha-OEIS)
W76-05034

APPARATUS FOR THE AERATION OF EFFLUENT WITH OXYGEN-CONTAINING GAS,
Hoeschst A.G., Frankfurt am Main (West Germany) (Assignee)
H. Gudernatsch, G. Jaekel, W. Kroll, V. Oden, and K. Reinhardt.
U.S. Patent No. 3,926,810, 3 p, 5 fig, 11 ref; Official Gazette of the United States Patent Office, Vol 941, No 3, p 1335, December 16, 1975.

Descriptors: *Patents, *Waste water treatment, Water pollution treatment, Water pollution control, Water purification, *Aeration, Oxygen, Equipment, Bubbles.

Effluent is aerated with oxygen containing gas in an aeration basin. The basin is composed of a number of aeration boxes placed parallel to each other, spaced apart from each other and connected to each other by a manifold. The aeration boxes have flattened horizontal upper sides penetrated by a number of gas outlets. The aeration boxes have a rectangular cross-section area and terminal surface areas. The boxes are made of plastic material and are open at the bottom. Each of the gas outlets is provided from below with a central counterbore which prevents activated sludge from caking together in the region of the gas outlets and ensures an optimum passage of oxygen from the gas to the effluent in fine bubbles. (Sinha-OEIS)
W76-05035

READILY ATTACHABLE WATER FILTER WITH CUTOFF VALVE,
Aqua-Chem, Inc., Milwaukee, Wis. (assignee)
For primary bibliographic entry see Field 8C.
W76-05038

THE COSTS OF BIOLOGICAL WASTE WATER TREATMENT (DIE KOSTEN DER BIOLOGISCHEN ABWASSERREINIGUNG),
Eidgenoessische Technische Hochschule, Zurich (Switzerland).
J. Negaard.
Dissertation No. 5335, Eidgenoessischen Technischen Hochschule Zuerich, Zurich, Switzerland, 1975. 175 p, 45 fig, 12 tab.

Descriptors: *Waste water treatment, *Sewage treatment, *Treatment facilities, Construction costs, *Biological treatment, Statistical methods, *Cost analysis, Operating costs, Analytical techniques, Regression analysis.
Identifiers: Switzerland.

Data were collected from 50 Swiss sewage treatment plants. An analysis of these data showed functional relationships between construction and operating costs. For various types of costs, the simultaneous effects of important parameters were determined by multiple regression techniques. This proved to be more reliable than previous research involving only a single parameter. Results of the cost analyses are presented in several tables and graphs. (Kramer-FIRL)
W76-05044

PHOSPHORUS MOVEMENT IN SOILS: THEORETICAL ASPECTS,
Cleveland State Univ., Ohio. Dept. of Chemical Engineering.
For primary bibliographic entry see Field 5B.
W76-05048

A SUPPLEMENTAL SOCIO-ENVIRONMENTAL DECISION TOOL: VALUE CONFLICTS ON LONG ISLAND,
Weston (Roy F.) Inc., Roslyn, N.Y.
K. J. Phillips.
Journal of Environmental Systems, Vol. 5, No. 2, p 103-113, 1975. 1 fig, 1 tab, 11 ref.

Descriptors: *Groundwater, *Recharge, *Sewers, *Septic tanks, *Water quality control, Nitrates, Planning, Environmental effects, Costs, Public Health, Waste disposal, Sewage treatment, Municipal wastes, *New York, *Artificial recharge.
Identifiers: Value conflicts, *Long Island(NY).

The groundwater quality of Long Island, New York, has deteriorated due to the cumulative effects of recharge through cesspools and septic tanks. In particular, increasing concentrations of nitrates have been measured at levels of up to twice the accepted health standards. To alleviate these conditions, a plan of replacing the individual waste disposal systems with se is being implemented. This paper focussed on value conflicts expected from the environmental impacts of the sewering plan. Values involving economics (costs of sewers and treatment facilities) and inconvenience and aesthetics (excavation, rerouting and detouring of streets) are juxtaposed with the values of health and convenience with the advent of an odor free and dependable waste disposal system. (Kramer-FIRL)
W76-05049

THE RATE OF PSYCHROPHILIC AND MESOPHILIC BACTERIA IN DIFFERENTLY POLUTED WATERS OF BUDAPEST (A PSYCHROPHIL ES A MESOPHIL BAKTERIUMOK SZAMANAK ARANYA KUELOENBOEZO SZENNYEZETTSEGII BUDAPESTI VIZEKBEN),
For primary bibliographic entry see Field 5A.
W76-05053

INVESTIGATIONS ON THE MICROBIAL REDUCTION OF SULPHATES,
Adam Mickiewicz Univ., Poznzn (Poland). Inst. of Geography.
F. Domka, and J. Gasiorek.
Acta Microbiologica Polonica, Ser. B., Vol. 7, No. 1, p 61-72, 1975. 11 fig, 3 tab, 13 ref.

Descriptors: Kinetics, *Sulfates, *Microorganisms, *Microbial degradation, Sulfur, Equations, Analytical techniques, *Waste water treatment, Industrial water.

The kinetics of the microbiological reduction of sulfates have been investigated. The reduction was carried out by Desulfovibrio. Microbial reduction of sulfates may be applied for industrial purposes, including the use of phosphogypsum, gypsum, or anhydrite wastes as raw materials for sulfur or sulfuric acid production. Sewage sludge, enriched with calcium sulfate, may also be utilized. In this paper, optimal conditions were defined for the reaction and were found to be at 35 degrees and pH 7. The reaction order, kinetics equation, and the effects of the temperature and pH of the medium on the conversion of sulfate to sulfide were also presented. (Kramer-FIRL)
W76-05054

WATER WORKS PLANT STATISTICS.
For primary bibliographic entry see Field 5F.
W76-05055

UNSATURATED FLOW DURING SOIL TREATMENT OF SEPTIC TANK EFFLUENT,
Soil Survey Inst., Wageningen. (Netherlands)
For primary bibliographic entry see Field 5B.
W76-05058

FINANCING AND MANAGEMENT OF THE PROPOSED SEWERAGE SCHEME FOR JAIPUR TOWN,
Jaipur Public Health Engineering Dept. (India). Planning Circle.
M. S. Kachwaha.
Journal of the Institute of Engineering (India), Vol. 55, Part PH3, p73-75, June, 1975. 2 tab, append.

Descriptors: *Sewerage, *Sewers, *Financing, *Management, Capital, Municipal wastes, Costs.
Identifiers: Jaipur City(India), *India.

The proposed sewerage scheme for Jaipur City, India, is discussed. In 1963-64, a scheme was designed for 610,000 people at a cost of Rs 2.04 crores. Since this has already been surpassed, a new scheme has been designed for the estimated 1991 population, 12.5 hundred thousand people, at a new cost of Rs 14.95 crores. It is assumed that as many sewer connections will be needed as there are water connections. It is hoped that unsewered city residents would accept a sewer connection at a price of Rs 450, since the costs of soak pits and septic tanks are more and these provide only temporary relief. It is desirable to levy development charges on existing plots for providing sewerage systems. Considering estimates of residential land in 1991, this can produce capital receipts of over Rs 90 million. Capital receipts from commercial and industrial land are estimated at Rs 47 million. Considering population and sewer increases by 1991, connection charges will result in almost Rs 22 million in capital receipts. It is proposed that the Public Health Engineering Department of the State will run, maintain, and manage the completed scheme.The scheme is proposed to be completed by 1979-80. New sewer connections will be spread out over the years at an average of about 3,350 per year. It is concluded that the scheme would not only be viable but would also be self-supporting. (Pinto-FIRL)
W76-05062

CATALYZED PROCESS AND CATALYST RECOVERY,
Sterling Drug, Inc., New York. (Assignee).
R. B. Ely, E. M. Pogainis, and C. A. Hoffman.
United States Patent 3,912,626. Issued October 14, 1975. Official Gazette of the United States Patent Office, Vol. 939, No. 2, p 931-932, October, 1975. 1 fig.

Descriptors: *Patents, *Waste water treatment, *Oxidation, *Chemical precipitation, *Separation techniques, *Solids removal, Suspended solids, *Catalysts.
Identifiers: Cupric ion, Silver ion, Wet oxidation.

A patent has been issued for a method of waste water treatment by wet oxidation. The oxidation is performed at a temperature between 150 and 340 C and a pressure between 200 and 4000 psi in the presence of either cupric or silver ion in a concentration between 10 and 10,000 mg/liter. The resulting oxidized waste water is subjected to liquid-solid separation to remove non-catalytic suspended solids. The liquid phase is then treated with a source of sulfide ions which reacts with the cupric or silver ion, forming an insoluble precipitate containing cupric or silver sulfide. The precipitate is then separated from the liquid phase and reintroduced into the wet oxidation reactor. Thus, silver or cupric ions are regenerated for the catalysis of additional waste water. (Kramer-FIRL)
W76-05064

THE USE OF ADENOSINE TRIPHOSPHATE MEASUREMENTS IN THE CONTROL OF THE ACTIVATED SLUDGE PROCESS BY THE SOLIDS RETENTION TIME METHOD,
University Coll., Cardiff (Wales). Dept. of Microbiology.
M. Statham, and D. Langton.
Process Biochemistry, Vol. 10, No. 8, p 25-28, October, 1975. 6 fig, 4 tab, 12 ref.

Descriptors: *Activated sludge, *Sludge treatment, *Waste water treatment, Biochemical oxygen demand, Treatment facilities, Flow rates, Suspended solids, Microorganisms, *Pollutant identification.
Identifiers: *Adenosine triphosphate, *Solids retention time, Mixed liquor suspended solids, Sludge volume index.

Successful operation of the activated sludge process requires that the sldge settle quickly or the quality of the final effluent will be severely reduced. Experiences in the control of an activated sludge plant are described. Some problems that have arisen in the control of the plant being studied are: it must be run as two lanes of four aeration pockets; it is impossible to operate at a recycle ratio of less than 0.6; and surface water infiltrates into the sewerage system. In an attempt to control the plant, observations were made of biochemical oxygen demand (BOD), Lflow rate, recycle rate, wastage rate, mixed liquor suspended solids (MLSS), sludge volume index (SYI), and a relatively novel parameter, the adenosine triphosphate concentration (ATP). The theory of solids retention time (SRT) is discussed. For the sludge to have good settling characteristics, the food to microorganism ratio must be kept within certain limits. A model is described that relates microorganism growth to this ratio or loading factor to calculate the sludge wastage rate. The method developed of SRT control requires only flow data and no laboratory work. ATP extraction procedures and measurement techniques are described. Standard techniques were used to measure MLSS, BOD, and SVI. Results show that for SVI values lower than 250, ATP concentration is related to SVI. SRT's of six to nine days should be avoided in the plant studied. For the best BOD removal efficiencies, higher SRT's are required. The SRT method of control is strongly recommended. (Pinto-FIRL)
W76-05065

SEWAGE AS A RESOURCE,
Wessex Water Authority, Bristol (England). Operations Directorate.
J. Coldrick.
New Scientist, Vol. 68, No. 973, p 276-278, October 30, 1975.

Descriptors: *Sewage, *Sewage treatment, *Waste water treatment, Sewage disposal, Waste water disposal, Sludge, Sludge digestion, Treatment, Disposal, Sewage effluents, Resources.
Identifiers: *Sewage utilization, *Sludge utilization, Sewage resources, Great Britain.

A large portion of the capital expenditure of Britain's Regional Water Authorities will be spent on new sewerage schemes or new sewer treatment facilities. The work of the Wessex Water Authority, which uses sewage as a resource, is discussed. Though there may be no universally applicable sewage treatment process, certain principles always apply. Sludges produced from primary treatment differ from sludges produced from secondary treatment. The sludge can be treated by anaerobic or aerobic digestion, heat treatment, air drying, or mechanical dewatering. The aim is to produce as cheaply as possible a residue that is non-toxic, non-polluting and inoffensive. Sea disposal is economic and can be of benefit to marine life. Application to agricultural land is particularly valuable. A small proportion of air dried sludge is sold as fertilizer and soil conditioner. In most cases, this sludge is given away to farmers. The sludge gas produced in the digestion process can be used as a source of energy. The possibility of using sludge gas for vehicular propulsion has been considered, but the scrubbing and compression costs make it a less attractive proposition. Sewage effluents can be used in cooling or quenching processes or in cement works where high grade water is not necessary. Sewage has been used in fish production in parts of Europe to good advantage. Another possibility is the growing of algae in sewage to reduce inorganic pollution. (Pinto-FIRL)
W76-05066

EXPERIMENTAL WORK ON THE SETTLEMENT OF SEWAGE,
T. Stones.
Effluent and Water Treatment Journal, Vol. 15, No. 10, p 529, 531, 533, 535, 537-541, October, 1975. 10 fig, 12 tab, 7 ref.

Descriptors: *Sewage, *Sewage treatment, *Waste water treatment, Chemical precipitation, Toxicity, *Biological treatment, Flocculation, Sedimentation, Aeration, Suspended solids.
Identifiers: Mechanical flocculation.

A review of the experimental work on the settlement of sewage is presented. Despite its chemical complexity, the constituents of sewage can be classified into four groups: large solids which can be removed by screening; coarse suspended solids which can be separated by sedimentation; finely dispersed solids which can be separated only after uniting into larger particles; and soluble solids. Biological sedimentation, pre-aeration, chemical precipitation, and mechanical flocculation are discussed. It has been shown that a greater amount of biological purification occurs during tank treatment than was previously thought. Toxic constituents may interfere with the sedimentation stage. It is concluded that tank treatment provides biological purification, settles the solids, and balances the fluctuations in strength in the incoming sewage. Pre-aeration has no effect on the character of the sewage after settlement and it does not promote the deposition of solids during settlement. It may help maintain aerobic conditions. Small dosages of lime and acid, added for chemical precipitation, may hinder purification because of the suppression of the biological purification that they may cause. Mechanical flocculation promotes good floc formation of coagulated matter, which then settles rapidly. However, it was found to be effective only when used in conjunction with a coagulating agent added for chemical precipitation. (Pinto-FIRL)
W76-05067

CIL TO TEST NEW SEWAGE UNIT.
Canadian Chemical Processing, Vol. 59, No. 10, p 32, 34, October, 1975. 1 fig.

Descriptors: *Sewage treatment, Sewage, *Waste water treatment, Effluents, Oxygen, *Treatment facilities.
Identifiers: *Deep shaft process, Henry's Law.

Canadian Industries Limited (CIL) has designed a deep shaft sewage treatment process that will handle biodegradable effluents at a lower energy input than the activated sludge process. The principal is based on a corollary of Henry's Law: the solubility of a gas in a liquid increases under pressure. A deep column allows more air absorption than do surface aerators. The process consists of a shaft a few hundred feet deep partitioned into two vertical sections. Screened, degritted sewage is pumped into the center column and mixes with an air stream and a biological culture. This provides oxygen and assures that the incoming fluid moves downward and the outgoing, aerated liquid moves upward. Estimates show that this system will require about 50 to 70% of the power used in the activated sludge process. Tests have shown that 90% of the oxygen in this process will undergo reaction, whereas in the activated sludge process, only 10% undergoes reaction. This means that less sludge and more carbon dioxide will be produced. The economics of oxygen enrichment do not look promising because of the increased solubility. Cryogenic oxygen was offered at 15 dollars per ton. Atmospheric oxygen could be fed into the system for 6 dollars per ton for small systems and 3 dollars per ton for large systems. (Pinto-FIRL)
W76-05068

FEASIBILITY OF HYDRAULIC TRANSPORT OF GROUND HOUSEHOLD REFUSE THROUGH SEWER APPURTENANCES,
Foster-Miller Associates, Inc., Waltham, Mass.
D. A. Monaghan, and A. R. Guzdar.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-239 915, $5.75 in paper copy, $2.25 in microfiche. Environmental Protection Agency, Report EPA-670/2-74-021, April, 1974. 138 p, 15 fig, 14 tab, 4 ref.

Descriptors: *Sewers, Wastes, *Waste disposal, *Solid wastes, Pipes, Hydraulics, Flow rates, Equipment, Cleaning, *Percolation.
Identifiers: Ground household refuse, Hydraulic transport.

The feasibility of hydraulic transport of ground refuse in conventionally designed sanitary sewers was investigated. Experiments were conducted on the gravity flow of ground household refuse through inverted siphons, running traps, bends, manholes, pump well inlets, lift stations, and obstacles. Evaluations were presented on: the minimum flow rate at which refuse slurry can be satisfactorily transported through the pipe system; the rates, types, and classes of materials deposited in the pipe system and its appurtenances; and design modifications needed to minimize deposition of material or other conditions leading to unsatisfactory flow. Results of laboratory investigations with an experimental test loop showed that the hydraulic transport of ground refuse at concentrations of up to 1.0% is feasible. However, at a refuse concentration of 1.5%, significant increases in pressure drop were noted. It was concluded that for flow velocities of 2.5 feet per second and above, any head losses become negligible. It was also found at steady state that heavy solids accumulate at specific locations with small increases of head loss but no danger of blockage. Periodic cleaning of the pipes was recommended to minimize the need for excessive scouring. (Kramer-FIRL)
W76-05070

USE OF ENVIRONMENTAL ANALYSES ON WASTEWATER FACILITIES BY LOCAL GOVERNMENT,
Teknekron, Inc., Washington, D.C. Applied Research Div.
J. C. Fensterstock, and D. M. Speaker.
Available from the National Technical Information Service, Springfield, Va 22161, as PB-237 515, $5.25 in paper copy, $2.25 in microfiche. Environmental Protection Agency, Report EPA-600/5-74-015, July, 1974. 200 p, 10 fig, 7 append.

Descriptors: *Treatment facilities, *Decision making, *Federal jurisdiction, *State jurisdiction, *Waste water treatment, Analytical techniques, Legislation, Construction costs, Training, Environmental effects, Local governments.
Identifiers: Governmental funding.

The waste water treatment facility grant application process was analyzed as conducted at four case study sites: Jacksonville, Florida; Hot Springs, Arkansas; Nassau-Suffolk Counties, New York; and East Bay Municipal Utility District, California. Problems identified included: inadequate environmental orientation of the staffs, exclusion of lay public input, intra/inter-organizational conflicts, inadequate guidelines, and timing of environmental analyses for local consideration of consequences. It was found that environmental considerations played a relatively minor role in the decision-making process. Recommendations for local, state, and Federal implementation included: Federal funding to state and local agencies for training staffs, more precise Federal guidelines, legislative changes, and suggestions to increase public participation in the entire decision-making process. (Kramer-FIRL)
W76-05072

CONTROL OF OIL AND OTHER HAZARDOUS MATERIALS,
Environmental Protection Agency, Cincinnati, Ohio. Office of Water Program Operations.
For primary bibliographic entry see Field 5G.
W76-05073

AUDIOVISUAL INSTRUCTIONAL UNITS FOR WATER POLLUTION CONTROL TRAINING PROGRAMS,
Environmental Protection Agency, Cincinnati, Ohio. Office of Water Program Operations.
For primary bibliographic entry see Field 5G.
W76-05074

MUNICIPAL WASTEWATER TREATMENT WORKS CONSTRUCTION GRANTS, REFERENCES, REGULATIONS, GUIDANCE, PROCEDURES.
Environmental Protection Agency, Washington, D.C. Office of Water Program Operations.
400 p. (1975).

Descriptors: *Regulations, *Legislation, *Federal Water Pollution Control Act, *Waste water treatment, Treatment facilities, Construction, Costs, Water quality control, Monitoring, Federal jurisdiction, Publications.
Identifiers: Construction grants program, Manuals.

This manual was published as an interim aid until the 'Construction Grants Manual' is issued (scheduled for 1976). This volume contains relevant program regulations, guidance, and technical information regarding the federal support of municipal waste water treatment facilities construction. Documents are grouped into six categories: construction grants and general grants; administration; provisions for environmental and social impacts and public participation; planning and state program assistance; permits and water quality monitoring; and other information. Legislation is detailed in copies of Federal Register articles. Several reference lists are also provided. (Kramer-FIRL)
W76-05075

WATER POLLUTION SURVEY, MOODY AIR FORCE BASE, GEORGIA,
Environmental Health Lab., Kelly AFB, Tex.
R. A. Virost.
Available from the National Technical Information Service, Springfield, Va 22161 as AD/A-003 212, $5.25 in paper copy, $2.25 in microfiche. November, 1974. 121 p, 5 fig, 29 tab, 3 ref, 8 append.

Descriptors: *Sewage treatment, *Treatment facilities, *Water analysis, Waste disposal, Filters, Water quality control, *Waste water treatment, Separation techniques, Industrial wastes, On-site investigations, Water quality, Georgia.

An analysis has been made of the Moody AFB, Georgia, sewage treatment plant operating logs for the period January to November 1973. On-site investigations were also conducted of the sewage treatment system, storm drainage system, and plant operators' laboratory procedures. The treatment facility was designed for 0.75 mgd and is a well-run low-rate trickling filter plant. Secondary treatment is provided to 0.393 mgd of average strength sewage. While the base has received its final NPDES permit, the plant will require modifications to meet water quality limits as of July 1, 1977. It was recommended that a stream dissolved oxygen survey be used to gather data on the effect of waste discharge on receiving waters. A sampling protocol was included to supplement sewage treatment plant monitoring requirements. Sources of industrial waste discharge to the storm sewer system were identified, and current planning includes oil-water separators and pipes to connect these streams to the sanitary system. (Kramer-FIRL)
W76-05076

MERCURY DYNAMICS IN A WARMWATER STREAM RECEIVING MUNICIPAL WASTEWATER,
Michigan State Univ., East Lansing. Inst. of Water Research.
For primary bibliographic entry see Field 5C.
W76-05077

FACTORS AFFECTING RESPIRATORY QUOTIENT--APPLICATION TO PURE OXYGEN SYSTEMS,
Manhattan Coll., Bronx, N. Y. Dept. of Environmental Engineering and Science.
J. A. Mueller, and A. S. Pannu.
In: Proceedings of the 29th Industrial Waste Conference, May 7-9, 1974, Purdue University, Lafayette, Indiana, p 846-856, 1975. 7 fig, 8 tab, 14 ref.

Descriptors: *Aeration, *Waste water treatment, *Biological treatment, Waste treatment, Alkalinity, Nitrification, Denitrification, Monitoring, *Model studies, Analytical techniques, Aeration, *Oxidation, *Kinetics.
Identifiers: *Respiratory quotient(RQ).

Factors influencing the design of pure oxygen aeration systems for both municipal and industrial wastes are discussed. Models have been developed relating gas transfer kinetics to the liquid phase biological oxidation kinetics. To accurately model complex waste treatment systems, basic biological parameters such as respiratory quotient (RQ) and cell composition are required. Because data on these parameters is generally non-definitive, experimental studies are needed. The factors affecting RQ have been shown to be: type of substrate; type of nitrogen nutrient; substrate removal efficiency, F/M loading cell yields and decay coefficients when nitrate is used as growth nutrient; and formation of partially oxidized intermediates. An often neglected parameter that can be used to quantitatively follow biological growth, denitrification, and nitrification is the alkalinity change. This can be easily monitored and gives an indication of nitrogen utilization. (Kramer-FIRL)
W76-05078

PRETREATMENT AND ULTIMATE DISPOSAL OF WASTEWATER SOLIDS,
Environmental Protection Agency, New York. Region II.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-239 868,

$11.50 in paper copy, $2.25 in microfiche. Report EPA-902/9-74-002, May 1974. Proceedings of a Research Symposium, Rutgers University, New Brunswick, N.J., May 21-22, 1974. 476 p, 106 fig, 84 tab, 195 ref. Edited by Arnold Freiberger.

Descriptors: Publications, *Waste disposal, *Sludge disposal, *Sludge treatment, Legislation, *Sewage sludge, *Waste water treatment, Environmental effects, Planning, Bioassay, Dewatering, *Bibliographies, Conferences, Reviews.
Identifiers: *Ocean disposal, Land application.

Fourteen papers have been published from a conference on the land disposal of sewage sludge. Topics included were: sludge handling and disposal; the stabilization of municipal sewage sludge by high lime doses; the thermal degradation of sludge; thickening characteristics of aluminum and iron primary sewage sludges; the dewatering of physical-chemical sludges; and the standards for sludge incinerators. Problems in sludge production and handling systems were also discussed. The Environmental Protection Agency's position on ocean disposal in the New York Bight was presented and economic considerations for the planning of a sewage sludge disposal system were outlined. Analytical methods were also proposed, such as bioassay for ocean sites and an evaluation of the impact of sludge discharge on an ocean bay. (See W76-05080 thru W76-05089) (Kramer-FIRL)
W76-05079

ELEMENTAL ANALYSIS OF WASTEWATER SLUDGES FROM 33 WASTEWATER TREATMENT PLANTS IN THE UNITED STATES,
National Environmental Research Center, Cincinnati, Ohio. Advanced Waste Treatment Research Lab.
B. V. Salotto, E. Grossman, III, and J. B. Farrell.
In: Research Symposium on Pretreatment and Ultimate Disposal of Wastewater Solids, May 21-22, 1974, New Brunswick, New Jersey, Rutgers University, p 23-71. 7 fig, 11 tab, 17 ref.

Descriptors: *Waste water treatment, *Sludge, *Chemical analysis, *Pollutant identification, *Metals, Treatment facilities, Municipal wastes, Mathematical studies, Anaerobic digestion, Domestic wastes, Elements(Chemical), United States, *Nitrogen, *Phosphorus, *Sulfur.
Identifiers: Atomic absorption analysis, Elemental analysis, Scandinavian sludge, Log-normal distribution, Heat of combustion.

Sludges, principally of the digested type, from 33 municipal waste water treatment plants in the United States, have been analyzed for 21 metals, and nitrogen, phosphorus and sulfur. The plants sampled ranged from small plants in urban communities to large plants in large cities. Some plants used primary treatment, some used secondary aeration and most used anaerobic digestion. Metal content was determined by an atomic absorption procedure. No detectable amount of beryllium was found in any sludge sample analyzed and although very toxic, it does not present a hazard in sludge disposal. Mathematical analysis of the data indicated that the distribution of heavy metals in sludge is approximately log-normal. This behavior is characteristic of all sludge types analyzed so far. Levels of metal in essentially domestic sludges were found to correspond closely to the 25th percentile distribution of metals in all sludges reported. Comparison of the levels of metals in United States sludges with corresponding levels in Scandinavian sludges showed higher levels in United States sludges. Variation of any particular metal in sludges of a particular waste water treatment plant was much less than in sludge samples taken from different plants. The contents of nitrogen, phosphorus, sulfur and volatile solids and heat of combustion were also determined for sludge samples. Heat of combustion was generally higher for raw primary sludge than for digested sludge because of the greater amounts of volatile solids. Phosphorus and sulfur were concentrated in digested sludge while nitrogen had a lower concentration. (See also W76-05079) (Pinto-FIRL)
W76-05080

STABILIZATION OF MUNICIPAL SEWAGE SLUDGE BY HIGH LIME DOSE,
Battelle Pacific Northwest Labs., Richland, Wash. Water and Waste Management Section.
C. A. Counts, A. J. Shuckrow, and J. E. Smith.
In: Research Symposium on Pretreatment and Ultimate Disposal of Wastewater Solids, May 21-22, 1974, New Brunswick, New Jersey, Rutgers University, p 73-125. 7 fig, 15 tab, 5 ref.

Descriptors: *Municipal wastes, *Sewage sludge, *Stabilization, *Lime, Sludge, Crop production, Chemical properties, Alkalinity, Bacteria, Odor, Sludge treatment, Sludge disposal, Soil treatment, Nutrients, Pilot plants, Humus.
Identifiers: Land application.

The degree of stability produced in sludges by the addition of large amounts of lime was determined initially in the laboratory and then in a large pilot plant. The effects of spreading lime stabilized sludges on land used for crop production were determined in small scale greenhouse studies and on larger outdoor plots. Initial laboratory studies were conducted to develop basic information on the lime stabilization process itself and to develop data for use in design and operation of a pilot plant. Lime requirements, time dependency of the lime/sludge reaction, and bacteria and odor reduction were studied, using primary municipal sludge mixed with humus. Chemical characteristics of the sludge and the method used to mix it determined the amount of lime required to raise the sludge pH. The lime sludge reaction caused a decrease in pH over time. Significant reduction in bacteria and odor were achieved by lime treatment. In pilot plant study, various lime doses were applied to raw sludge and system pH response was observed. The lime dose required to achieve a pH of 12 was affected by the chemical composition of the sludge. Bacteria was reduced by over 99%. Lime treatment also improved the sludge's settling characteristics. Application of sludge to a silt loam soil appeared to increase permeability with water and application to a sandy soil decreased permeability. Lime treated sludge did not significantly increase soil pH. Applied to cropland, it did increase the concentrations of nutrients available to the plants. When proper amounts of lime treated sludge were applied, soil productivity appeared to improve. Excessive concentrations of nutrients did not appear to be a problem. (See also W76-05079) (Pinto-FIRL)
W76-05081

SLUDGE INCINERATORS IN USE TODAY THAT MEET THE REQUIREMENTS OF STATE AND FEDERAL REGULATIONS,
For primary bibliographic entry see Field 5E.
W76-05082

ECONOMIC CONSIDERATIONS FOR PLANNING SEWAGE SLUDGE DISPOSAL SYSTEMS,
Rutgers - The State Univ., New Brunswick, N.J. Dept. of Environmental Science.
For primary bibliographic entry see Field 5E.
W76-05083

EPA'S POSITION ON OCEAN DISPOSAL IN THE NEW YORK BIGHT,
Environmental Protection Agency, New York. Region II.
For primary bibliographic entry see Field 5E.
W76-05084

PRELIMINARY SUMMARY OF SLUDGE DEGRADATION STUDIES IN A MARINE BENTHIC ENVIRONMENT,
Pacific Northwest Environmental Research Lab., Corvallis, Oreg.
For primary bibliographic entry see Field 5C.
W76-05086

BIOASSAY METHODS AND IMPACT EVALUATION OF OCEAN DISPOSAL SITES,
Mounmouth Coll., West Long Branch, N. J.
For primary bibliographic entry see Field 5A.
W76-05087

EVALUATING THE IMPACT OF SLUDGE DISCHARGE TO SANTA MONICA BAY, CALIFORNIA,
California Univ., Berkeley; and Southern California Coastal Water Research Project, Berkeley.
For primary bibliographic entry see Field 5C.
W76-05088

A DISCUSSION OF A NEAR FIELD DISPERSION MODEL FOR SLUDGE DISCHARGES TO COASTAL WATERS,
Pacific Northwest Environmental Research Lab., Corvallis Oreg.
For primary bibliographic entry see Field 5B.
W76-05089

A PILOT STUDY OF DRINKING WATER SYSTEMS IN THE NATIONAL PARK SERVICE,
Environmental Protection Agency, Washington, D. C. Office of Water Supply.
For primary bibliographic entry see Field 5F.
W76-05090

CROSS-CONNECTION CONTROL MANUAL.
Environmental Protection Agency, Washington, D. C. Office of Water Supply.
For primary bibliographic entry see Field 5F.
W76-05092

PETROLEUM PROCESSING WASTES, (LITERATURE REVIEW),
Weston (Roy F.), Inc., West Chester, Pa.
D. A. Baker.
Journal Water Pollution Control Federation, Vol. 47, No. 6, p 1476-1479, June, 1975. 25 ref.

Descriptors: *Waste water treatment, *Industrial wastes, *Oil industry, *Oil wastes, Activated carbon, Oxidation, Activated sludge, Aeration, Filtration, Flotation, Biological treatment, Toxicity, Phenols, Separation techniques, Automatic control, *Reviews, *Bibliographies.
Identifiers: *Petroleum refinery wastes.

The 1974 literature concerned with the treatment of wastes from petroleum refineries was reviewed. Reports are given for refinery wastes treated by the following processes: activated carbon adsorption; oxidation of sulfides to water soluble sulfates or thiosulfates; activated sludge; two-stage aeration followed by sand filtration; dissolved air flotation with chemical coagulation; joint removal of iron and sulfides; completely mixed activated sludge using a deep tank configuration; mechanical separation and recirculation of oily waste waters; and treatment of combined municipal and refinery effluents by biological methods. Toxicity studies were performed. Phenol was found to be the controlling toxicant in a significant number of oil refinery waste discharges. The toxicity was found to increase with temperature. Other topics in the current literature include disposal of refinery salt wastes, site location of new plants, microbial degradation of oil wastes, and automatic control of treatment facilities. (Orr-FIRL)
W76-05093

STEEL INDUSTRY WASTES, (LITERATURE REVIEW),
Illinois Inst. of Tech., Chicago. Dept. of Environmental Engineering.
J. W. Patterson, and M. H. Cheng.
Journal Water Pollution Control Federation, Vol. 47, No. p 1473-1476, June, 1975.

Descriptors: *Waste water treatment, *Industrial wastes, *Reviews, Standards, Biological treatment, Water pollution sources, Suspended solids, Coagulation, Filtration, Cyclones, Separation techniques, Oily wastes, Skimming, Underground waste disposal, Phenols, Ammonia, Sulfides, Lead, Zinc, Metals, Water reuse, *Bibliographies.
Identifiers: Steel industry, Effluent guidelines, Coke oven wastes, Pickling liquor, Metal finishing.

The recent literature dealing with the treatment of steel industry wastes was reviewed. Effluent guidelines and standards published by the EPA for the iron and steel manufacturing industry have established effluent limitations for ammonia, cyanide, oil and grease, suspended solids, sulfide, fluoride, nitrate, Pb, Mn, and Zn. Major waste water sources are coke oven gas washing and cooling, blast furnace washing, and steel rolling and finishing operations. Coke plant effluent, containing phenols, ammonia, cyanide, and thiocyanide, has been treated by biological methods. Steel rolling and finishing has four major types of waste water associated with it: pickling liquor; suspended solids; oily wastes; and blast furnace wash water. Recirculating systems have been designed for the latter. Coagulation, filtration, dissolved air flotation with coagulant agents, and cyclone separation have all been employed for suspended solids removal. Oily waste treatment usually consists of skimming in scale pits followed by filtration, coagulation, or air flotation. The steel industry has largely converted to HCl pickling because it allows for the regeneration of the acid for reuse by roasting and also permits the recovery of ferric chloride or ferric oxide as a byproduct. Subsurface disposal (deep well injection) of pickling liquor is also widely used. Pickling rinse waters may be treated by neutralization, aeration, oxidation, flocculation, and clarification. (Orr-FIRL)
W76-05094

TEXTILE WASTES, (LITERATURE REVIEW),
Talbot (Richard S.) Associates, Media, Pa.
R. S. Talbot.
Journal Water Pollution Control Federation, Vol. 47, No. 6, p 1465-1466, June, 1975. 10 ref.

Descriptors: *Waste water treatment, *Industrial wastes, *Textiles, *Reviews, Water pollution control, Standards, Activated carbon, Ozone, Reverse osmosis, Trickling filters, Color, Dyes, Oil, Chemical oxygen demand, *Bibliographies.
Identifiers: Wool scouring liquors, Pretreatment, Decoloration, Effluent guidelines.

A brief review of the 1974 literature on the treatment of textile wastes is presented. An evaluation of the economic effects of proposed effluent guidelines on the textile industry was prepared. The Ecological and Toxicological Associations of the Dye-stuff's Manufacturing Industry was found to pool information and financial support for research in their area. Methods reported for the decoloration of textile wastes included activated carbon, ozone, reverse osmosis, and reduction with hydrogen. Staging of trickling filter treatment of dyeing wastes was found to be capable of effecting greater than 70% BOD removal, but did not achieve decoloration. COD reductions to 55% were obtained by ozonation. Treatment with activated carbon in combination with ozone exhibited a synergistic effect on dyeing wastes. A case history of the pretreatment of wastes from screen printing synthetic fabrics prior to discharge into a municipal system was reported. Grease and oil were found to be the most troublesome constituents in wool processing effluents. Grease removal is considered necessary before biological treatment of wool-scouring liquors. (Orr-FIRL)
W76-05095

HISTORY AND DEVELOPMENT OF AWWA STANDARDS,
Alvord, Burdick and Howson, Chicago, Ill.
For primary bibliographic entry see Field 5G.
W76-05096

PROTECTING REINFORCED CONCRETE PIPE SANITARY SEWERS,
For primary bibliographic entry see Field 8F.
W76-05099

THE MOLECULAR WEIGHT DISTRIBUTION OF SOLUBLE ORGANICS IN SEWAGE AND SEWAGE EFFLUENTS USING GEL FILTRATION,
Rutgers - The State Univ., New Brunswick, N. J.
R. J. Carton.
Available from University Microfilms, Inc., Ann Arbor, Mich., 48106. Order No. 75-24,671. PhD Thesis, 1975, 165 p.

Descriptors: *Waste water treatment, *Sewage, *Activated sludge, Organic compounds, Molecular weights, Adsorption, Analytical techniques.
Identifiers: Total organic carbon.

In order to develop more sophisticated waste water treatment systems, our knowledge of specific chemical and physical changes occurring in sewage must be increased. The molecular weight distribution of soluble organic compounds in sewage, and in biologically and chemically treated effluents determined by gel filtration is described. Raw sewage and activated sludge effluent samples were taken from the Bernardsville, New Jersey, sewage treatment plant. Particulates were removed by sedimentation, ultracentrifugation, and filtration through a Millipore filter. Samples of raw sewage and effluent were also coagulated with ferric chloride, filtered and eluted on Sephadex. Samples containing less than 30 mg/liter TOC were concentrated by flash evaporation at 40C. The soluble fraction of raw sewage contained a continuous distribution of TOC from 0 to 1500 MW. The exclusion peak at Vo contained 21% of the organic carbon. About 40-50% of the TOC was partially adsorbed on the column. Concentration of the soluble fraction of raw sewage by flash evaporation changed the molecular weight distribution. One-third of the compounds above 1500 MW were coagulated and removed by filtration through a 0.45 micrometer Millipore filter. Coagulation with ferric chloride produced alterations in the molecular weight distribution. No peak was present at 1500 MW, and the amount of low molecular weight compoundsght compounds for ferric and chloride ions, and then the colloidal particles and high molecular weight compounds are coagulated. About 42% of the activated sludge effluent of the TOC compounds were greater than 1400 MW as compared to about 20% for raw sewage. (Orr-FIRL)
W76-05101

CHARACTERIZATION OF USAGE AND WASTEWATER IN ROADSIDE REST AREAS,
West Virginia Univ., Morgantown.
A. V. Peddada.
Available from University Microfilms, Inc., Ann Arbor, Mich., 48106. Order No. 75-21,949. PhD Thesis, 1975, 282 p.

Descriptors: *Sewage treatment, *Water supply, *Statistical analysis, *Equations, *Computers, Highways, Water consumption, Design criteria, Planning, *Waste water treatment.
Identifiers: Highway rest areas.

Five highway rest areas in different geographical locations were evaluated in terms of traffic, water consumption, sewage production, and sewage strength. Data was collected and processed by computer. Statistical analyses were used to develop design equations for water supply and sewage treatment design parameters. The equations developed may be used to design future rest area sewage and water supply systems. (Kramer-FIRL)
W76-05102

RATES AND MECHANISMS OF CHEMICAL REACTIONS DURING FLOW OF SECONDARY TREATED SEWAGE EFFLUENT THROUGH POROUS BEDS,
California Inst. of Tech., Pasadena.
J. Uradnisheck, III.
Available from University Microfilms, Inc., Ann Arbor, Mich., 48106. Order No. 74-24792. PhD Thesis, 1975, 356 p.

Descriptors: *Waste water treatment, *Sewage treatment, *Soil, Percolation, Chemical reactions, Ion exchange, Waste water disposal, Porous media, *Path of pollutants.

The rates and mechanisms of chemical reactions which occur as secondary treated sewage effluent flows through porous beds were studied. Experimental data show that the variation of aqueous cations in inorganic percolating solutions is the result of consecutive stages of rapid ion exchange of cations from the electric double layer followed by slow ion exchange of chmisorbed cations diffusing through aluminosilicate mineral structures. High concentrations of alkaline earth salts which remain in interstitial solutions when solution is drained from granitic sand are caused by desorption of cations from the sand by aqueous hydrogen ions. The hydrogen ions are generated by the conversion of adsorbed ammonium ions to nitrite ions by Nitrosomonas. A slight amount of mineral dissolution occurs. When a solution is again percolated through the sand, only a slight degree of nitrification accompanies the hydrogen ion desorption. A mathematical model is presented which can be used to predict the variation of aqueous calcium, magnesium, sodium, ammonium, nitrate, nitrite, oxygen, acidity, and bicarbonate ions as well as the bacterial population densities, adsorbed cations, and gaseous constituents of a soil column and solution as an intermittent percolation process is operated. (Orr-FIRL)
W76-05103

REFINERY DESIGN (CIRCA 1984),
Fluor Engineers and Constructors, Inc., Los Angeles, Calif.
J. E. Llovet, H. J. Klooster, and D. G. Chapel.
Chemical Engineering Progress, Vol. 71, No. 6, p 85-90, June, 1975. 5 fig, 3 tab, 1 ref.

Descriptors: *Industrial wastes, *Waste water treatment, *Oil industry, *Design criteria, Oil pollution, Energy budget, Environmental control, Project planning, Treatment facilities, Environmental effects, Aesthetics.
Identifiers: Refinery design, Task force approach.

Refinery design must be based on a balance of energy conservation, environmental control, and profit considerations. A task force approach to refinery design allows an early comparison of energy saving concepts and systems which must be studied in order to achieve the desired balance. Current, proven hydrogen refinery processes and related technologies should be used to upgrade crude oil in a refinery configuration meeting energy/environmental objectives. Innovative designs which contain, retain, treat, and recirculate a maximum of effluent gas and liquid streams will also aid in achieving these goals. Development of advanced refinery design layout and operational controls will minimize the impact of the refinery in the local area. Nine environmentally related objec-

tives which should be included in overall refinery design are: atmospheric emissions control; waste liquid treatment; solids handling/disposal; noise abatement; site utilization; construction and operation controls; light abatement; odor control; and aesthetics. The factors affecting energy conservation are specific to each refinery and depend on such parameters as fuel availability and cost, site location, environmental regulations, and initial capital outlay vs. reduced future operation costs. (Orr-FIRL)
W76-05104

EFFECT OF TEMPERATURE AND SLUDGE LOADING ON BOD5 REMOVAL AND SLUDGE SETTLEABILITY IN ACTIVATED SLUDGE SYSTEMS TREATING BLEACHED KRAFT EFFLUENTS,
B. C. Research, Vancouver, (British Columbia).
E. G-H. Lee, J. C. Muller, and C. C. Walden.
Tappi, Vol. 58, No. 6, p 100-103, June, 1975. 6 fig, 2 tab, 10 ref.

Descriptors: *Waste water treatment, *Industrial wastes, *Pulp wastes, Biochemical oxygen demand, *Activated sludge, *Sludge treatment, Temperature, Microorganisms, Populations, Protozoa.
Identifiers: Bleached kraft wastes, Sludge settleability, Food/microorganism ratio, Metazoa, *BOD5 removal.

Temperature and food/microorganism ratio (F/M ratio, equivalent to sludge loading) effects on BOD5 removal, sludge settleability, and changes in microbial populations in activated sludge systems treating bleached kraft effluent were evaluated. F/M ratios ranged from 0.1 to 2.4. Temperatures tested were 16, 30, 36, and 40C. Overall BOD5 removal was good at all temperatures and F/M ratios; a small decrease occurred when the temperature and F/M ratio were increased. At temperatures greater than 30 C, sludge settleability was significantly inhibited. F/M ratios had little effect on sludge settleability. Suspended solids content increased greatly with increasing temperature, but was not significantly affected by F/M ratios. F/M ratios and temperature were observed to have minimal effects on sludge volume indices. Increased temperatures (greater than or equal to 36C) caused a drastic reduction in the numbers of protozoa and metazoa present in the activated sludge. However, protozoa and metazoa grew well in bleached kraft effluent within their suitable temperature ranges. Although the microorganisms necessary to achieve BOD5 reduction are present from 16-40C, the poor sludge settleability at the higher temperatures may be an indication that the microorganisms present at these temperatures are not as effective in the production of the polysaccharide considered to be the cementing material in activated sludge. (Orr-FIRL)
W76-05105

EFFLUENT CONTROL AND WATER CONSERVATION AT BOWATER-SCOTT MILL, NORTHFLEET.
Water Services, Vol. 79, No. 951, p 196-197, May, 1975. 3 fig.

Descriptors: *Waste water treatment, *Industrial wastes, *Pulp wastes, Treatment facilities, Flocculation, Equipment, Screens, Polymers, Water reuse, Sumps, Coagulation, Sludge treatment, Filtration, *Water conservation.
Identifiers: Vacuum filtration, Alum, Anionic polymers, Cationic polymers, United Kingdom.

Bowater-Scotts' disposable paper products plant at Northfleet in Kent, U.K., has built a new 80,000 gph effluent treatment plant. The effluent from the mill is segregated into two streams: a 'clean' stream containing fiber from the paper-making machines; and, a 'dirty' stream from floor drains and overflows. Each stream is collected by a 25,000 gallon capacity sump and fed into a Contact Flocculator by a sump pump through a magnetic flowmeter. The dirty stream is also passed through a screen to remove coarse rubbish before entering the flocculator. Alum (50-150 ppm) and an anionic polymer are used as the coagulants in the clean water flocculator, while a cationic polymer is used for the dirty water. Sludge from both flocculators is passed to a common sludge tank and then fed to a rotary vacuum sludge filter. Water from the clean water flocculator is fed to a reusable water tank. The dirty water with a maximum solids content of 10 ppm, is discharged to a river. (Orr-FIRL)
W76-05106

HOW MILLS COPE WITH EFFLUENT SUSPENDED SOLIDS,
Great Southern Paper Co., Cedar Springs, Ga.
O. D. Smith, R. M. Stein, and C. E. Adams.
Paper Trade Journal, Vol. 159, No. 17, p 35, July, 1975.

Descriptors: *Waste water treatment, *Industrial wastes, *Pulp wastes, *Aerated lagoons, Suspended solids, Coagulation, Filtration, Costs, Georgia.
Identifiers: Unbleached kraft wastes, *Holding ponds, Mixed media filtration, Clarification.

Great Southern Paper Company's plant at Cedar Springs, Georgia, is an integrated unbleached kraft-neutral semi-chemical cross recovery pulp and paper mill. The wastes from the plant are treated in an aerated lagoon and then flow into a 160 million gallon holding pond before being discharged into a river. The river is regulated by a hydroelectric navigation dam which causes a low flow during the weekend due to reduced power requirements. As a result, the mill's effluent can only be discharged between Monday and Friday. Monitoring of the suspended solids (ss) level of the effluent indicated that good removal was being achieved over the weekend but that the level of ss in the effluent increased during the week. The decreasing solids reduction is attributed to the fact that the rate of discharge from the holding pond during the week is higher than the flow rate into the pond, resulting in a shorter detention time. Chemical coagulation; a conventional clarifier, with or without the use of coagulant aids; and mixed-media filtration were evaluated for their ability to reduce the concentration. The results of the studies showed that the ss in the effluent of a pulp and paper mill can be reduced but only by the use of a large system with significant chemical addition. The price of reducing ss to 4.2 lb/ton of product was estimated to be $3.17/ton of product. (Orr-FIRL)
W76-05107

POLLUTION CONTROL IN THE SWEDISH PULP AND PAPER INDUSTRY,
Swedish Pollution Control Co., Stockholm.
H. Norrstroem.
Ambio, Vol. 4, No. 2, p 80-86, 1975. 3 fig, 4 tab, 35 ref.

Descriptors: *Waste water treatment, *Industrial wastes, *Pulp and paper industry, Water pollution control, Water pollution sources, *Pollution abatement, Foreign research, *Pulp wastes.
Identifiers: *Sweden, SSVL Environmental Care Project.

The discharge of air and water pollutants from the Swedish pulp and paper industry is rapidly decreasing. This decrease is attributed to the regulations of the Environmental Protection Act and process improvements and development work done by the Swedish pulp and paper industry including pollution-decreasing measures developed during the SSVL Environmental Care Project. Water pollutants from the industry include colored material, biodegradable material, toxic material, and salts. Process discharges by the industry are summarized. Suitable choice of process, internal process modifications, and external effluent treatment are the methods to reduce the water pollution. A reduction in effluent volume and discharge of pollutants from washing and screening operations can be effected by improving the washing efficiency and closing the water systems in screening. Accidental discharges should be collected as soon and as undiluted as possible and then should be recycled. Existing internal measures for reducing the pollution from the bleaching effluents include: lowering the lignin content of the unbleached pulp; changing the bleaching conditions; and, instituting oxygen bleaching. Although the pulp and paper industry in Sweden has grown rapidly, the pollution level has been reduced to that of the 1920's. (Orr-FIRL)
W76-05108

THE FATE OF TURPENTINE IN AERATED LAGOONS,
Beak Consultants Ltd., Vancouver (British Columbia).
D. Wilson, and B. Hrutfiord.
Pulp and Paper Canada, Vol. 76, No. 6, p 91-93, June, 1975. 3 fig, 3 tab, 9 ref.

Descriptors: *Waste water treatment, *Industrial wastes, *Pulp and paper industry, *Aerated lagoons, *Pulp wastes, Pollutant identification, Biochemical oxygen demand, Sulfur compounds.
Identifiers: *Turpentine, Terpenes, Bleached kraft wastes, Unbleached kraft wastes.

The identification of turpentine and related compounds in bleached and unbleached kraft pulp mill waste water and their fate in aerated lagoons was determined. Twenty-one monoterpenes were identified in the influent and effluent of the aerated lagoon samples. Also identified were two organo-sulfur compounds, diethyl disulfide and dimethyl trisulfide, not previously found in kraft mill waste water. The bleaching process appeared to have no effect on the turpentine compounds. The ease of degradation of the terpenes decreased in the following order: alcohol, hydrocarbons, ketone. Camphor and fenchone are produced in the lagoon, most probably by microbial transformation of terpene alcohols. The turpentine concentrations were reduced to less than one ppm; this level appears to cause self-limitation of removal efficiency. Terpene concentration level was implicated in the BOD5 removal efficiency of the lagoon. The average turpentine removal efficiency was 90 percent for the lagoon receiving unbleached effluent and 65 percent for the one receiving bleached effluent. (Orr-FIRL)
W76-05109

PURIFICATION OF TEXTILE WASTE WATER-RESULTS OF EXPERIMENT SERIES (REINIGUNG VON TEXTILABWAESSERN-ERGEBNISSE VON VERSUCHEN),
B. Hoeke, and G. Piepenbreier.
Gesundheitstechnik, No. 6, p 117-124, June, 1975. 14 fig.

Descriptors: *Waste water treatment, *Industrial wastes, *Textiles, *Activated carbon, Pilot plants, Oxidation, Precipitation, Flocculation, Chemical oxygen demand, Color.
Identifiers: Decoloration, *Wet catalytic oxidation, Total organic carbon, *Alkaline waste water.

Pilot tests concerning the purification of alkaline waste waters generated in the textile industry are described. The test results were achieved when the waste water to be treated was first neutralized with flue gases containing carbon dioxide and sulfur dioxide, after which three-stage wet catalytic oxidation with activated carbon in an aeration tank was performed. The activated carbon particles were continuously regenerated through constant friction on each other in the suspension. The catalytic oxidation was followed by precipitation and flocculation by the addition of ferrous sulfate, aluminum sulfate, and flocculating agents such as polyacrylamide and silicic acid. The reduction

achieved by this procedure in the COD and TOC levels amounted to 86-90%, respectively; full decoloration was reached. Stable sludge suitable for normal disposal was obtained. (Takacs-FIRL)
W76-05110

THE TREATMENT OF TEXTILE DYEHOUSE EFFLUENT,
Water Services, Vol. 79, No. 951, p 198-199, May, 1975. 1 fig.

Descriptors: *Waste water treatment, *Industrial wastes, *Textiles, Dyes, *Pilot plants, *Biological treatment, Biochemical oxygen demand, Color, Treatment facilities, *Filtration.
Identifiers: Flocor, Plastic media, *Biofilter.

A pilot plant study using Flocor plastic media was performed on the effluent from the textile works of John Heathcoat, Ltd. at Triverton, G. B. The major conclusions of the study included: the main source of contamination was the discharge of effluent from the dyehouse; the BOD content of the dyehouse waste averated between 30 and 100 mg/liter with a maximum value of 400 mg/liter; the fluctuations in pH necessitated automatic and regular control; and, a high-rate plastic biofilter medium was an effective means of reducing the BOD to the acceptable 40 mg/liter level and also provided a reduction in color. As a result of the pilot study conclusions, a fullscale one mgd treatment plant has been built. It comprises a high-rate biofilter plant incorporating balancing facilities of 60,000 gal capacity, automatic pH control and reagent feed facilities, and a 12 x 2.4 x9 m biofilter tower packed with 226 cu m of Flocor. Advantages of the plant are that it requires less land area than a comparable facility, needs minimal maintenance, and is capable of handling shock loads of BOD. (Orr-FIRL)
W76-05111

PRODUCTION OF FEED YEAST FROM LIQUID WASTE,
Hochschule fuer Bodenkultur, Vienna (Austria). Institut fuer Angewandte Mikrobiologie.
J. Meyrath.
Process Biochemistry, Vol. 10, No. 2, p 20-22, April, 1975. 2 fig, 2 tab.

Descriptors: *Waste water treatment, *Industrial wastes, *Activated sludge, *Yeasts, Fermentation, Economics.
Identifiers: Yeast production.

Yeast, rather than bacteria, can be used in the purification of waste water by activated sludge. Conditions necessary for economic success are high yield based on COD; high productivity per unit fermenter volume; low pretreatment costs of the wastes; easy recovery of yeast from low-concentration media; and economical additive and cooling water requirements. The use of highly flocculant yeasts enables these requirements to be met by eliminating the need for centrifugal separation. Also, the ability to operate at elevated temperatures (40 C) is an economic asset. To eliminate extensive cooling requirements, thermophilic yeast strains must be used (such as Candida krusei, or Candida tropicalis). To demonstrate the efficiency of this process, Saccharomyces kloeckerianus was used with a sugar solution (4.17 g/liter), and with mineral salts as an additive. The solution was fed (2.8 liter/hour) to a fermenter with a culture volume of 3.5-3.7 liter, pH of 4.2, and temperature of 39 C. Overflow drained into a 150 ml conical vessel where yeast sedimentation occurred immediately. Sedimentary yeast was returned dry to the fermenter so that a yeast concentration of 15.1 g was maintained. Excess yeast could then be collected from a second sedimentation vessel. Productivity can be raised at will, since it depends on the concentration of yeast in the fermenter, feed rate of nutrient solution to the fermenter and the oxygen transfer capacity of the fermenter. This procedure is well suited for small installations, as the process is simple and insensitive to microbial contamination. (Murphy-FIRL)
W76-05112

A NEW CONCEPT IN SLUDGE FILTRATION THEORY FOR INDUSTRIAL APPLICATION,
Air Force Weapons Lab., Kirtland AFB, N. Mex. Environics Lab.
S. P. Shelton, and J. C. Burdick, III.
Filtration and Separation, Vol. 12, No. 3, p 233-237, May/June, 1975.4 fig, 8 ref.

Descriptors: *Waste water treatment, *Industrial wastes, Model studies, *Sludge treatment, *Filtration, Separation techniques, *Mathematical models.
Identifiers: Vacuum filtration, Filtration velocity, Cake compression, *Sludge filtration.

A quantitative model was developed to describe sludge filtration processes as a function of the characteristics of fluid, suspended particles, and filter media. The model, primarily concerned with vacuum filtration systems, requires data that describes the sludge, filter, and the operating conditions in order that the relationship between flow time, pressure drop, and efficiency can be evaluated. It considers the change in filtration velocity at constant pressure across the filter system, and can consider cake compression by expression of cake thickness and bulk density as a pressure dependent function. The new concepts developed for application to sludge filtration performed well in the parameter study, which indicated that sludge particles and their concentration strongly influenced their filtration characteristics. The model agreed well with preliminary experimental data, including the prediction of the relationship between pressure drop and cake thickness for incompressible and compressible filters. The described sludge filtration model, developed from aerosol mechanic theory, adequately predicts flow, time, pressure and efficiency relationships. (Murphy-FIL)
W76-05114

FOAM SEPARATION - A TECHNIQUE FOR WATER POLLUTION ABATEMENT,
B. C. Research, Vancouver (British Columbia).
K. S. Ng, and J. C. Mueller.
Water and Sewage Works, Vol. 122, No. 6, p 48, 52, 54-55, June, 1975. 6 fig, 19 ref.

Descriptors: *Waste water treatment, *Industrial wastes, *Foam separation, *Foam fractionation, *Froth flotation, Separation techniques, Surfactants, Alkylbenzene sulfonates, Operating costs, Textiles, Food processing industry, Bubbles.
Identifiers: Metals removal, Surface active agents.

Foam separation, the process that selectively separates the surface active components of a solution at the surfaces of ascending bubbles, can be characterized by two mechanisms: foam fractionation and froth flotation. Foam fractionation separates dissolved substances from homogenous solutions. The liquid phase hydrophobic group of the surface active molecule migrates to the bubble-liquid interface and becomes stable with air. The hydrophilic poles of the molecules remain in the liquid phase. The bubbles float to the top of the liquid and form a foam blanket in which the surface active material accumulates. When the foam layer is removed, the surface active substances are removed. Similarly, froth flotation removes insoluble suspended matter by providing sites for attachment of hydrophobic suspended matter through pressurized dissolved air release. The foam layer which forms can then be removed. Foam fractionation is presently used for removal of ABS detergents, anionic sodium dodecylsulfate and cationic hexadecylpyridinium chloride. The operating cost using a mechanical air dispersion system ranges from 2.7 to 3.5 cents per 1000 gal/ton for a 10 mgd plant. This process has been proposed for concentrating proteins from dilute solutions; and for use in treatment of wastes from food processing and textile plants. It may also become a practical technique for the treatment of metal contaminated water. (Murphy-FIRL)
W76-05115

BLEACHING AND CLARIFYING OF AQUEOUS EFFLUENT.
French Patent 10128W/06. Issued March 21, 1975.
French Patents Abstracts, Vol. W, No. 18, p 3, June, 1975.

Descriptors: *Waste water treatment, *Industrial wastes, *Chemical wastes, Ozone, Chlorine, *Patents, Effluents, Aqueous solutions, Color.
Identifiers: Vitamin B2, Clarification, *Bleaching, Decolorization.

A patent has been issued for a method of bleaching and clarifying the aqueous effluent from the preparation of vitamin B2. The decoloration/clarification is accomplished by injecting finely divided air and finely divided ozone at almost the same point in the waste stream. The air will contain preferably 4-6 percent ozone. Chlorine may also be injected but not enough for all the ozone to react. The ratio of chlorine to ozone can be 1:5 to 3:1, but is preferably 1:2. This process is more effective and less expensive than previous methods. (Orr-FIRL)
W76-05116

REMOVAL OF TRACE LEVELS OF 2-ACETYLAMINOFLUORENE (2-AAF) FROM WASTEWATER,
National Center for Toxicological Research, Jefferson, Ark.
C. R. Nony, E. J. Treglown, and M. C. Bowman.
The Science of the Total Environment, Vol. 4, p 155-163, 1975. 3 fig, 1 tab, 5 ref.

Descriptors: *Waste water treatment, *Industrial wastes, Chemical wastes, *Adsorption, *Filters, *Activated carbon, Polymers, Pilot plants, Pollutant identification, Trace elements.
Identifiers: *2-Acetylaminofluorene, Polymeric adsorbents, Spectrofluorometry.

A pilot scale adsorption is described for the removal of ppb levels of the chemical carcinogen, 2-acetylaminofluorene (2-AAF), from industrial waste water. The system consists primarily of filters, activated carbon, and non-ionic polymeric adsorbents arranged in tandem. The process is highly efficient, operates at low cost, and requires little maintenance. A highly sensitive and specific spectro-fluorometric identification technique was developed for monitoring the raw or treated waste water. The method is sensitive to the 0.2 ppb level of the chemical. Several other possible methods for removing 2-AAF were evaluated. These included millipore filtration, distillation, organic solvent extraction, alkaline hydrolysis, and carbon and non-ionic polymeric adsorption. Only the adsorption techniques were effective in removing 2-AAF and were therefore incorporated into the pilot system. Future modification of the system will include the scaling-up of the components to provide a higher capacity. (Orr-FIRL)
W76-05117

THE BREAKDOWN OF SYNTHETIC ORGANIC COMPOUNDS IN BIOLOGICAL PROCESSES,
Water Pollution Research Lab., Stevenage (England).
N. S. Thom, and A. R. Agg.
Proceedings of the Royal Society of London B., Vol. 189, No. 1096, p 347-357, May, 1975. 4 tab, 13 ref.

Descriptors: *Waste water treatment, *Industrial wastes, *Chemical wastes, *Biodegradation, Persistence, Organic pollutants, Toxicity.
Identifiers: Synthetic chemicals, United Kingdom, Relative biodegradability.

The biodegradability of what are considered to be the most important synthetic chemicals, relative to water pollution, in the U.K. is discussed. Over 200 compounds have been sorted into one of three generalized groups: compounds readily removed by biological processes; compounds requiring acclimatization of the degrading organism; and, compounds resistant to biodegradation. The discharge of easily biodegraded substances to a sewage treatment plant requires control only of the volume and rate of aeration of the plant. In order to achieve removal of compounds which may be removed if acclimatization is reached, three conditions must be fulfilled: the initial concentration at which the compound is to be applied to the treatment plant should be very low and be gradually increased to the final concentration; there must be a continuous discharge of the pollutant; and, once acclimatization has been reached and removal is achieved, the concentration of the compound must remain relatively constant. Some of the non-biodegradable substances may be removed by adsorption onto sludge or clay. The use of others, such as 'hard' synthetic detergents and organochlorine insecticides, has been severly restricted. Many of the persistant chemicals are toxic to mammals and aquatic life. Information on the biodegradability of any compound must be considered in relation to the ambient conditions. (Orr-FIRL)
W76-05118

TREATMENT OF PROCESS WATER,
Petro-Tex Chemical Corp., Houston, Tex.
P. Merchant.
United States Patent 3,890,227. Issued June 17, 1975. Official Gazette of the United States Patent Office, Vol. 935, No. 3, p 1205, June, 1975.

Descriptors: *Waste water treatment, *Industrial wastes, *Chemical wastes, Polymers, Chemical precipitation, *Patents, Salts.
Identifiers: *Polymerization process wastes.

A process designed for the treatment of process water from polymerization process has been patented. The process provides for the removal of salts of the condensation product of naphthalene sulfonic acids and formaldehyde. The process water to be treated contains these salts in an amount less than two weight percent and contains less than five percent total solids. The aqueous composition containing the salts is mixed with a polyalkylene amine of the formula H2N(-R-NH)xH, where R is an aliphatic radical of one to five carbon atoms and x is from one to twelve. The pH is maintained at less than 5.0 by the addition of acid. The salts are thereby precipitated out of solution. (Orr-FIRL)
W76-05119

RECYCLING OF COOLING WATER IN CABLE MANUFACTURE,
Western Electric Co., Buffalo, N.Y.
S. R. Benenati.
Wire Journal, Vol. 8, No. 6, p 61-65, June, 1975. 7 fig.

Descriptors: *Waste water treatment, *Industrial wastes, *Cooling water, *Water reuse, Cooling towers, *Recirculated water, Water consumption, Water conservation, Industrial water, *Recycling, New York.
Identifiers: Zero discharge, Cable manufacturing wastes.

The Buffalo Works (Buffalo, N.Y.) of the Western Electric Company recirculates and reuses the water required for cooling hot plastic jacketing as it is extruded and formed around the outside of cable. Water consumption has been reduced by 95 percent; conservation equals about 90 million gal/year. The system uses a unique injection, spray type commercial cooling tower chosen because of its reliability, ease of installation and maintenance, and reduced installation and maintenance costs. The cooling tower, two pumps, and a previously unused tank comprise the recirculating system. There are two water circulating loops in the system. The second loop is activated to send more water through the cooling tower circuit when the temperature of the water from the first loop rises above a given temperature. Water supply and temperature adjustmentis automatically controlled. The recirculating system has performed successfully since its initiation in December 1972. The costs of the system have been offset by the reduction in the need for municipal water. The system represents one way to reduce industrial water consumption and to achieve zero discharge. (Orr-FIRL)
W76-05120

NEW BUILDING DESIGNED WITH POLLUTION CONTROL IN MIND.
Plant Engineering, Vol. 29, No. 13, p 36, 40, June, 1975.

Descriptors: *Waste water treatment, *Industrial wastes, Metals, Neutralization, Oxidation, Chemical precipitation, Filtration, Water reuse, Potable water, Chromium, Cadmium, Copper, Suspended solids, Treatment facilities, Indiana.
Identifiers: *Plating wastes, *Metal finishing wastes, Cyanide.

Penn Control's plating and finishing processes building in Goshen, Indiana, was designed with a continuous-batch treatment system in the basement. The system applies cyanide oxidation and chromium reduction principles to produce potable water from plating wastes containing cyanide, chromium, cadmium, copper, and other suspended solids. The effluent treatment system consists of two 700-gal tanks which receive chromic acid conversion coating rinse water, two 1100-gal tanks which receive all the cyanide rinse water, and one 7000-gal neutralization tank which receives treated water from the chromic acid and cyanide tanks plus all the other process waters. The chromic acid wastes are treated with sulfur dioxide and then liquid caustic soda (NaOH) to reduce the chrome to the trivalent form. Chlorine gas and sulfuric acid are used in sequence to oxidize the cyanide to sodium cyanate and then to carbon dioxide, carbonates, and other nontoxic compounds. The treated waste waters flow into the neutralization tank where precipitation of the trivalent chrome, heavy metals, and solids occurs. Water from the neutralization tank is filtered through a deep-bed filter that uses a 25 micron, roll-type paper with an automatic dispensing system. (Orr-FIRL)
W76-05121

APPARATUS AND PROCESS FOR TREATING TOXIC WASTE MATERIALS,
A. N. Sulfaro, and A. H. Stein.
Canadian Patent 970,485. Issued July 1, 1975. Patent Office Record, Vol. 103, No. 26, p 83, July, 1975.

Descriptors: *Waste water treatment, *Industrial wastes, *Patents, Toxicity, Monitoring, Chromium, Metals, Equipment, Aquatic life.
Identifiers: *Metal finishing wastes, Cyanide, *Two-stage treatment, *Chemical treatment.

An apparatus and method for the continuous treatment and destruction of toxic constituents in waste water streams from metal finishing processes has been patented. It is designed for the treatment of aqueous rinse solutions containing dissolved hexavalent chromium and cyanide compounds present in concentrations which are toxic to marine ecology. The apparatus and process provide for a two-stage treatment of such waste streams. The streams are continuously recirculated in each stage and their chemical characteristics are continuously monitored and adjusted to maintain optimum conditions for the desired chemical reaction which will remove the toxic constituents. The monitoring also ensures that the effluent to be discharged from the treatment apparatus does not contain any harmful constituents. (Orr-FIRL)
W76-05122

TREATMENT TECHNIQUE FOR HARMFUL SUBSTANCES IN WATER POLLUTION (SUISHITSU ODAKU KANKEI YUGAI BUSHITSU SHORI GIJUTSU),
S. Sakai.
PPM, Vol. 6, No. 5, p 60-76, May, 1975. 6 fig, 17 tab.

Descriptors: *Waste water treatment, *Industrial wastes, *Oxidation, *Ozone, *Electrolysis, Ion exchange, Heavy metals, Iron, Nickel, Filtration, Flotation, Chromium, Foreign research, Legislation.
Identifiers: *Metal plating wastes, *Cyanide complex ions, Cobalt, Japan.

Industrial waste water treatment is discussed in terms of the removal of harmful substances as defined in Japan's water pollution control law. The most economical and efficient water treatment is one in which the waste water is collected in segregated streams. The waste water from metal plating factories contains highly concentrated cyanide ions which exist as metal cyanide complex ions. Cyanide can be decomposed by oxidation methods such as alkali salt and chloride gas combination, ozone, or electrolytic oxidation. However, iron, nickel, or cobalt containing cyanide waste water cannot be treated by these oxidation methods. An alternative method is the addition of ferrite ion to the water, forming stable insoluble ferrocyanide complexes. The use of ion exchangers for heavy metal removal from the effluents from various chemical industries as well as metal plating factories is an expensive operation. With pH adjustment of waste water, most heavy metals will form water insoluble metal hydroxides which can be removed from the water by filtration or flotation techniques. The pH adjustment of the water must be controlled to avoid the formation of the soluble complex ion of amphoteric metal hydroxide. The waste water containing chromic acid ions should be reduced to free chromium ions which then can be removed from the water in the form of chromium hydroxide. (Katayama-FIRL)
W76-05123

CONTAMINATED WATER PURIF(ICATION).
Belgian Patent 24133W/14. Issued April 22, 1975. Derwent Belgian Patents Reports, Vol. W, No. 19, p 1, June, 1975.

Descriptors: *Waste water treatment, *Industrial wastes, Color, Dyes, *Patents, Water purification, *Chemical reactions, Iron.
Identifiers: Ferric hydroxide, Chemical treatment.

A process for the purification of an aqueous liquid contaminated with colored substances has been patented. The contaminated water which is free from dye complexing retarders, is treated with ferric and/or ferrous ions. This reaction results in the formation of ferric hydroxide which is removed together with the colored substances from the water. (Orr-FIRL)
W76-05126

AIR OXIDN PROCESS OF SOUR WATER.
French Patent 59711U/40. Issued March 21, 1975. French Patents Abstracts, Vol. W, N. 18, p 3, June, 1975.

Descriptors: *Patents, *Waste water treatment, *Industrial wastes, *Oil wastes, *Pulp and paper industry, Oxidation, Sulfur compounds, Sulfates, Sulfite liquors, Sulfides.
Identifiers: Liquid phase air oxidation, Petroleum refinery wastes.

A patent has been issued for an air oxidation process which is useful for the treatment of waste water from petroleum refining and paper production. It is specifically designed for the continuous treatment (liquid phase air oxidation) of water containing sulfide anions and one or more other anions selected from thiosulfates, tetrathionates, polythionates, sulfites, and polysulfides. The method comprises: adjusting the pH to 6-13 and heating the water to 121-271 C; oxidizing with a non-catalytic oxidizing medium containing 0-500 percent excess oxygen based on the stoichiometric conversion of sulfide to sulfates at 5.3-56.0 kg/sq cm at a L.H.S.V. of 0.5-12.0 volumes feed/reactor void volume; and, recovering an effluent containing only sulfate anions. (Orr-FIRL)
W76-05127

PURIFICATION OF WASTE WATERS BY FILTRATION THROUGH FINELY DISPERSED ACTIVATED CARBON,
L. A. Puzatkina.
Available from the National Technical Information Service, Springfield, Va, 22161, as ADA-007 861, $3.25 in paper copy, $2.25 in microfiche. Translation FSTC-HT-2 3-0282-75, November 1974. 6 p, 1 fig, 2 tab. Translated from Moskovskii Inzhenero-Stroitelnyi Institut imenii V. V. Kuyby, sheva: Issledovaniya po ochistke stochnykh vod, 71/122-127.

Descriptors: *Activated carbon, *Filtration, *Adsorption, *Water purification, *Waste water treatment, Treatment facilities, Recycling, Filters, Separation techniques, Water quality, Water pollution, Chemistry, Analysis, Liquid wastes, Carbon filters, Suspended solids, Perlite.
Identifiers: Trinitrotoluene, Carbon powder, Cartridge filters, Hydrocarbon removal, Filtering surface, Multi-stage installation, Carbon regeneration, TNT.

A procedure was described for removing trinitrotoluene from wastewater by passing the wastewater through a battery of three successively joined activated carbon filters. The filters were arranged so that any filter could be removed for cleaning by replacing it with a fourth carbon filter in the battery. Before passing to the carbon filters, the wastewater was filtered through a perlite filter to remove suspended solids. The cost of purification of one cubic meter of wastewater by the proposed set-up would amount to 20 copecs without including the cost of carbon regeneration. Purification of wastewaters by other methods would cost not less than 5-10 roubles per cubic meter. (Henley-ISWS)
W76-05167

THE DRY DEEP PIT SYSTEM,
Purdue Univ., Lafayette, Ind.
R. L. Adams.
Poultry Tribune, Vol. 77, p. 26, 28, April, 1971. 2 fig.

Descriptors: *Farm wastes, *Poultry, Odor, Water pollution, Ventilation, *Waste treatment.
Identifiers: *Deep pits, Flies.

Odors, flies, and nutrients in water courses are the typical pollution problems associated with poultry. All can be eliminated by use of a deep (8 to 10 ft.) pit under the poultry house if it is kept dry. Install and maintain a proper watering system. Mechanical ventilation will be required for high-density chicken populations. The pit may never require cleaning. (East Central)
W76-05172

TREATMENT OF DAIRY WASTES BY MECHANISED BIOLOGICAL METHODS,
S. R. Alagarsamy, and B. B. Bhalerao.
Indian Journal of Environmental Health, Vol. 14, No. 3, p. 225-235, 1972. 3 fig, 1 tab, 5 ref.

Descriptors: *Farm wastes, *Waste treatment, *Dairy industry, *Aerated lagoons, *Design, *Costs, Oxidation lagoons, Biological treatment.
Identifiers: *India, *Oxidation ditch, Mechanized biological treatment.

Because wastes from dairy plants are rich in degradable organic matter and exert a high oxygen demand, adequate treatment is necessary. The degree of treatment depends on mode of disposal either into water courses or on land for irrigation. Among the mechanized biological methods available, the aerated lagoon and the oxidation ditch are relatively easier to install and operate. Only partial treatment by aerated lagoon with 1.15 days detention time is sufficient for disposing the final effluent to land for irrigation. An oxidation ditch should be used where the treated effluent is intended to be discharged into water courses. The waste treatment problem of a dairy with large capacity has been considered as a case study and detailed designs and cost studies for aerated lagoon and oxidation ditch methods have been worked out. (Cameron-East Central)
W76-05174

ON THE HORNS OF THE DAIRY WASTE DILEMMA,
F. F. Smith, S. E. Bishop, J. C. Oliver, W. C. Fairbank, and W. W. Wood, Jr.
Western Dairy Journal, Vol. 31, No. 9, p. 10-13, July 1975.

Descriptors: *Dairy industry, *Farm wastes, California, *Regulation, *Costs, Water pollution control, *Recycling, Pollution abatement.
Identifiers: Earth corrals, Recycled Aerated Manure(RAM).

The impact of new requistion on the Southern California Dairy industry is examined. At least eight factors have been found to influence the choice of waste management alternatives -- land values (investment costs); land taxes; cow density (or manure application) limitations imposed by water control agencies; cow density limitations imposed by local governmental planning authorities; production responses attributable to geographical region; production responses attributable to the side effects of waste management facilities (heat, cold, mud, rain, etc.); operating costs; and net revenue realized from cropland used for waste disposal. A method is presented for assessing these variables. The profitability of dairying in Southern California is determined mainly by land values and pollution prevention requirements. A comparison is made of two management systems -- (1) the earth corral and (2) the Recycled Aerated Manure System (RAM), in which cows are maintained in roofed, open-sided structures, with air-dried manure used as absorbent bedding. Waste management investment costs are $167 per cow and $38.50 per cow for RAM and earth corral systems, respectively. 'All other costs' for the year are $760 and $775 for RAM and the earth corral, respectively. RAM provides (1) conditions for c cleaner cows, (2) a more compact layout, (3) a more convenient site for examing and treating cows, (4) better u dder health, (5) fewer foot or leg injuries, and (6) reduction in fly control costs. It is concluded that the RAM system offers a viable and competitive solution for waste management. (Penrod-East Central).
W76-05175

BORON TOXICITY IN RED PINE FOLLOWING MUNICIPAL WASTE WATER IRRIGATION-RUA.
New Zealand Forest Service, Rotorua.
For primary bibliographic entry see Field 5C.
W76-05177

NEBRASKA DOMESTIC AND INDUSTRIAL LIQUID WASTES DISPOSAL RULES.
Nebraska Environmental Control Council, Lincoln.
For primary bibliographic entry see Field 6E.
W76-05219

KANSAS AGRICULTURAL WASTES REGULATIONS.
For primary bibliographic entry see Field 6E.
W76-05220

ALASKA WASTEWATER DISPOSAL REGULATIONS.
For primary bibliographic entry see Field 6E.
W76-05223

A RATIONAL APPROACH TO DECISION MAKING IN THE REGIONALIZATION OF WASTEWATER TREATMENT SYSTEMS,
Pittsburgh Univ., Pa. Dept. of Civil Engineering.
D. W. Weeter, and J. G. Belardi.
Available from the National Technical Information Service, Springfield, Va 22161, as PB-250 749, $5.00 in paper copy, $2.25 in microfiche. Research Report No. SETEC CE 75-018, May 1975, 85 p, 9 fig, 12 tab, 2 append. OWRT A-035-PA(1), 14-31-0001-5038.

Descriptors: *Economies of scale, *Optimization, *Waste water treatment, *Regional analysis, Sewage districts, Planning, *Pennsylvania, *Algorithms, *Decision making, Alternative costs, Treatment facilities.
Identifiers: Sensitivity analysis, Wastewater collection, Regionalization.

The concept of regionalization as it applied to planning of wastewater treatment and collection facilities is introduced. Generally, the problem is to find the minimum cost alternative for the location and number of treatment plants given a discrete set of wastewater generators. Literature solutions to the regionalization problem are reviewed for possible application to regional areas in Southwestern Pennsylvania. Modifications were made to improve the neuristic algorithm of McCouagha and Converse. The improved algorithm was applied to two case study regions. Results from the algorithm were compared to results obtained by an iterative approach used by Southwestern Pennsylvania Regional Planning Commission. Sensitivity analyses performed on the improved neuristic algorithm indicate a wide range of uncertainty in cost estimation. A conclusion is that a deterministic approach may not be very practical for selection of an optimum, or at least cost, solution in a regional wastewater system. A more rational method may be the use of risk analysis or other stochastic processes. (Sink-Penn State)
W76-05251

FIELD-LEVEL PLANNING FOR AREAWIDE WASTE TREATMENT MANAGEMENT: A MODEL FOR PLANNING UNDER SECTION 208 OF THE FEDERAL WATER POLLUTION CONTROL ACT,
North Carolina Univ., Chapel Hill. Dept. of City and Regional Planning.
D. H. Moreau.
Prepared for Triangle J Council of Governments, Research Triangle Park, N. C. April 1975. 335 p, 29 fig, 28 tab, 105 ref, 8 append.

Descriptors: *Water Pollution Treatment, *Regional development, Water resources, *Planning, *Alternative planning, *Federal Water Pollution Control Act, Water management, Water policy, Regional analysis, Environmental effects, *North Carolina, Water quality.
Identifiers: *Research Triangle Region(NC), *Public participation, Chapel Hill(NC), Durham(NC), Raleigh(NC).

The Research Triangle Area of North Carolina, including cities of Raleigh, Durham and Chapel Hill, was the first area in the U.S. to request designation

as a planning area under Section 208 of the Federal Water Pollution Act of 1972. This report on that pilot s tudy can serve as a guide for similar efforts. Part I sets forth a theoretical framework for the planning process and addresses difficulties of adapting models to real situations. The purposes of the study were: selection of an areawide water quality management plan consisting of policies and programs, necessary public agencies, and organizational arrangements for making political decisions; undertaking of a public forum for discussion of the consequences of alternative growth policies; and providing local governments with information related to water quality. The planning process included discussion of objectives, surveys of existing systems, establishment of operational goals, generation and testing of alternatives and evaluation. Several problems are apparent in adapting the established planning framework to other '208' areas: no single unit of government is responsible for the whole area; there are few explicit policy guidelines; there is no clear notion about where growth should occur; and many pollution control techniques are not familiar to planners. Part II lists elements and tasks to be performed during execution of the planning process. A time schedule of these is given as they occured in the Research Triangle effort. Specific guidelines are included in appendices: pollution source analysis; data sources; legal, organizational and financial analyses; and analysis of biological elements for environmental assessment. (Smith - North Carolina)
W76-05261

TRANSPORT PHENOMENA APPLIED TO SLUDGE DEWATERING,
Dorr-Oliver, Inc., Stamford, Conn.
P. Kos, and D. D. Adrian.
Journal of the Environmental Engineering Division, Proceedings of ASCE, Vol. 101, No. EE6, p 947-965, December, 1975. 6 fig, 2 tab, 19 ref.

Descriptors: *Sludge treatment, *Dewatering, *Filtration, Sludge disposal, Equipment, Mathematical models, Model studies, Hydraulic conductivity, Pressure, *Waste water treatment, Water treatment.

A mathematical model for flocculent porous media has been developed. The increase of concentration in sludges is due to the increase of effective pressure, which is the major parameter governing the concentration changes of sludge during the dewatering process. The application of the mathematics of transport phenomena in porous media yielded a partial differential equation the to the evaluation of effective pressure changes. In describing a sludge dewatering process, the physical characteristics of the coefficient of linear compressibility and the hydraulic conductivity must be measured. Voluminous flocculent sludges are generated in waste water treatment and water treatment plants. The deformation of the matrix of these sludge solids should be similar to the measured sludge, and this model should be valid for all flocculent sludges and suspensions. This model can also be used to describe the performance of sludge dewatering equipment in cases where the equipment performance was not clearly described by the specific resistance concept. (Kramer-FIRL)
W76-05264

THE LARGE-SCALE REGIONAL PLANT HYPOTHESIS: DISCRIMINANT ANALYSIS,
Kentucky Univ., Lexington. Dept. of Economics.
For primary bibliographic entry see Field 5G.
W76-05267

ANAEROBIC FILTER TREATMENT OF PHARMACEUTICAL WASTE,
Missouri Univ., Rolla. Dept. of Civil Engineering.
J. C. Jennett, and N. D. Dennis, Jr.
Journal Water Pollution Control Federation, Vol. 47, No. 1, p 104-121, January, 1975. 12 fig, 6 tab, 17 ref.

Descriptors: Chemical industry, *Chemical wastes, *Waste water treatment, Industrial wastes, *Anaerobic treatment, *Filtration, Chemical oxygen demand, Recycling, *Filters.
Identifiers: *Anaerobic filters, *Pharmaceutical wastes.

The anaerobic filter has been applied to various synthetic wastes ranging from acetic acid to protein-carbohydrate substrates. This investigatin determined the treatability of a pharmaceutical waste by an anaerobic filter, evaluated a filter performance for various hydraulic and organic loding conditions, and subjected the filter to shock loading in order to determine the effect on its operation. The waste treated was from a pharmaceutical plant in Springfield, Missouri, and satisfied the prerequisite for treatment with an anaerobic filter: a relatively high COD and low SS. The anaerobic filter was found to successfully treat the pharmaceutical waste at COD concentrations from 1,000 to 16,000 mg/liter, when operated at 35 C with steady state removal efficiencies of 93.7 to 97.8 percent. High treatment efficiencies were achieved and maintained without solids recycle over an organic loading range of 13.8 to 220.0 lb COD/day/1,000 cu ft. The anaerobic filter was operated for six months without the need for solids disposal. Shock increases in organic loadings did not cause a failure in the capability of the filter to treat the waste. The anaerobic filter compares favorably with other waste treatment processes with respect to loads that may be applied and the removals that may be attained. The most significant advantage of the anaerobic filter is the fact that low cellular synthesis rates and long solids retention times enable the anaerobic filter to treat chemical and other wastes efficiently without the need for solids recycle or solids wasting. (Orr-FIRL)
W76-05275

OXIDATION OF ACETONE WITH OZONE IN AQUEOUS MEDIA IN THE TREATMENT OF ACETONE-CONTAINING WASTE WATER (OKISPLIENYE ATSIETONA OZONOM V VODNYKR SKRIEDAHR PRUMIENITIELNO K OBIEZVRIE-JIVANIYOU ATSIETONSODIER-JACHTIHR),
D. S. Gorienko-Giermanov, N. M. Vodopianova, N. M. Haruna, M. M. Gorodnov, and V. A. Zaitsiev.
Khimicheskaya Promyshlennost, No. 12, p 31-32, 1974. 2 fig, 1 tab, 5 ref.

Descriptors: *Ozone, *Waste water treatment, *Oxidation, *Chemical wastes, Costs, Kinetics, Laboratory tests, Industrial wastes.
Identifiers: *Acetone.

The oxidation of acetone with ozone in water was studied under laboratory conditions with respect to the purification of acetone-containing waste waters. The acetone concentration in the water ranged from 100-1,000 mg/liter. Calcium hydroxide was added to achieve quantitative oxidation of the waste water to carbonate and water. The time required for the quantitative oxidation of acetone was found to be a function of the rate of admission of ozone to the reactor and of the initial acetone concentration. The ozone requirement for the oxidation of one g acetone was calculated to be 4.74 g. The calcium hydroxide expenditure amounted to 3.81 kg per kg acetone. The cost of the oxidation at an acetone concentration of 100 g/cu m amounted to 0.26 Rbl per cu m. (Takacs-FIRL)
W76-05277

MERCURY GETS A ROASTING AT CHLORINE PLANT.
Chemical Week, Vol. 116, No. 10, p 32-33, March, 1975.

Descriptors: *Mercury, *Waste water treatment, *Chemical industry, *Chemical wastes, Industrial wastes, Costs, Sludge treatment, Chemical precipitation, Capital costs, Operating costs.
Identifiers: Chlor-alkali plant brine, Mercury cells, Brine-sludge roasting.

A three-year study at Georgia-Pacific's Bellingham, Washington, mercury-cell chlor-alkali plant has determined that high-temperature roasting can remove up to three times as much mercury from chlor-alkali plant brine sludge as any other method. Also concluded was that sulfide precipitation can reduce the mercury content of waste water to 50 ppb. The roasting unit utilized is a 75 sq ft, 4.5 ft inside-diameter, six-hearth furnace made by Envirotech's BSP Division. The unit processes 300-700 lbs of sludge per hour at operating temperatures of 1,000-1,400 F, and is capable of removing 98.3-99.8 percent of the mercury. The capital cost of the system, including collection equipment, a thickener, rotary vacuum filter, furnace and condensers, is $364,500 and operating cost is $35/ton of sludge treated. In addition to the system for treating the sludge, Georgia-Pacific also installed a treatment system for mercury-containing waste process water, collected from floor washings from the cell room, purger streams from the brine system and the cell end-box wash water recycle systems, drainage from caustic filtration and water from tank cleaning. The mercury content of this waste water ranged from 300 to 18,000 ppb. Sulfide precipitation was chosen as the treatment method because of the fewer process steps required, and the facts that the pH treatment necessary helps neutralize the cooling water effluent, precipitated mercury is in concentrated form and can be fed to the roasting furnace without adding significantly to the solids load, and sodium sulfide is inexpensive and leaves no additional contaminating ions after the excess sulfides are eliminated by available chlorine. The capital cost of this system is $143,900 and operating cost is $0.50/1,000 gallons. (Orr-FIRL)
W76-05278

TREATMENT OF WASTE WATER CONTAINING NITRATES.
French Patent FR 2219-910. Issued November 1, 1974. Derwent French Patents Abstracts, Vol. V, No. 52, p D2, February, 1975.

Descriptors: *Patents, *Waste water treatment, *Nitrates, *Evaporation, *Incineration, *Explosives, Chemical wastes, Industrial wastes.
Identifiers: *TNT wastes.

A patent has been issued for a method of treating waste water containing nitrates. The method involves partial evaporation followed by incineration. This incineration treatment of waste water is particularly useful for effluents from the manufacture of T.N.T. The waste water is partially evaporated in a contact vessel where it meets hot gases coming from the incinerator. The concentrate is pumped to the incinerator and enters alongside the burner, which is fed with natural gas. The incoming effluent pours into a perforated bowl at the top of the contact vessel. It then flows drop by drop through the bowl into the contact vessel. The steam and the hot gases pass into a washing tower where they are sprayed by industrial water under pressure. Any uncondensed gases are drawn by a fan up the chimney. The fuel consumption of this method, as compared with earlier processes, is reduced in the proportion of five to one. In addition, the apparatus is very simple and inexpensive. Any free hydrogen sulfide in the T.N.T. effluent is neutralized with caustic soda before being fed into the apparatus. (Orr-FIRL)
W76-05279

INDUSTRIAL OILS, RECOVERY OR DISPOSAL. (LES HUILLES INDUSTRIELLES, RECUPERATION OU ELIMINATION.),
M. Maes.
Machine Moderne, p 38-45, November, 1974. 2 fig, 8 tab.

Descriptors: *Oil wastes, *Industrial wastes, *Reviews, *Waste disposal, Recycling, Ozone, *Waste water treatment, Liquid wastes, Filtration, Powerplants.
Identifiers: *Oil wastes recovery.

A state-of-the-art review on the disposal of used industrial oils is presented, and methods for the regeneration and recovery of such oils are described. Some 15 percent of the used oils collected are regenerated by vacuum distillation for the expulsion of volatile hydrocarbons, and hydrolyzed with sulfuric acid with subsequent filtration and absorption. The recovered oil is processed in a refinery. Some of the used oil collected is incinerated in refineries or in thermal power plants, although most of the used oil is disposed of in sanitary landfills or else in an illegal manner. According to a new method, cutting oil is regenerated by ozonization at a consumption level of 50 g ozone per cu m oil, followed by filter pressing; this permits the recovery of 5 percent fuel oil. In another process the emulsion is broken by means of ferric chloride and polyelectrolyte. While the supernatant oil can be removed easily, the water containing iron salts is treated with sodium hydroxide for flocculation. Lubricating oils are subjected to ultrafiltration for the quatitative removal of insoluble components, using hexane as a solvent. If regeneration is no longer possible, the used oil is refined by decantation and filtration to recover fuel oil. (Takacs-FIRL)
W76-05280

DISPERSING OIL FILMS ON WATER.
French Patent FR 2213-093. Issued September 6, 1974. Derwent French Patents Abstracts, Vol. V, No. 44, p D2, December, 1974.

Descriptors: *Oily water, *Waste water treatment, Industrial wastes, *Patents, Organic compounds, Films, *Oil pollution, *Dispersion, Path of pollutants.
Identifiers: *Oil film dispersants, Petroleum wastes, Coal-tar effluents.

A method for the dispersion of oil films on water is described. The oil film may be formed by petroleum, vegetable, or coal-tar effluents. The patented composition which achieves the dispersion is a solution containing 3-50 weight percent of a nonionic dispersant and at least 75 weight percent of a water-insoluble oxygen containing organic compound. The oxygen containing organic compound may be one of the following: a mixture of 65-95 weight percent mixed 4-13 carbon alcohols, such as butyl, octyl, decyl, isooctyl and/or isodecyl alcohol, and 5-35 weight percent esters of these alcohols, such as the adipates, sebacates and/or phthalates obtained from the overhead vapors formed in alcohol esterification; a mixture of the oxo-bottom products obtained in the preparation of 6-13 carbon oxo-alcohols, such as isodecyl or isooctyl alcohol; or, a mixture of the first and second compound mixtures. The nonionic dispersant is preferably a 16 carbon alkanolamide of fatty acids, ethylene glycol monomethyl ether or a polycarboxylic fatty acid ester. The composition may be used in 10-100 weight percent of oil concentration and is sprayed on the water surface containing the oil film. (Orr-FIRL)
W76-05281

TOTAL--NEW GRASS-ROOTS PLANT FOR THE DUTCH,
D. J. Cooper, and F. H. Fransen.
The Oil and Gas Journal, Vol. 73, No. 6, p 51-54, February, 1975. 3 fig, 1 tab.

Descriptors: *Oil wastes, *Waste water treatment, *Separation techniques, Oily water, Equipment, Water pollution control, Europe, *Treatment facilities.
Identifiers: Refinery waters, *Netherlands.

A new grass-roots oil refinery has been built at Borselle, The Netherlands, on the north bank of the Schelde estuary. The location of the refinery near the Schelde allows the barge shipment of finished products on the inland-waterway system which extends throughout western Europe. It also increases the importance of containing all oil-contaminated waters and treating them before they are released. A schematic picture is presented of the treatment of waste waters at the refinery. The waste waters are segregated into uncontaminated and oil-contaminated streams. The uncontaminated water, mainly rainwater and demineralizer regeneration effluent, is stored in a storm-water retention center, fed under level control to the observation basins, and then released. Two separate collections are made of oil-contaminated waters. One contains water which may be contaminated with leaded oil and the other with non-leaded oil. Each contaminated stream has its own oily water pit, oil-water interceptor separator, and slops-settling tanks. The oil-water separator is a tilted-plate-interceptor type utilizing screw-type pumps to minimize emulsion formation and containing multiple 'Packs' which effect the oil-water separation. After the interceptor treatment, the oily water is sent to the slops-settling tanks where more oil-water separation occurs. The oil is skimmed from the tops of the tanks; crude oil is sent to the crude tanks and leaded oil is pumped to the gasoline storage. The special system for the prevention of groundwater pollution, the treatment of oil-contaminated sludge from the oil-water separators, and the safety features of the storm-water retention and observation basins are also described. (Orr-FIRL)
W76-05282

BIOLOGICAL TREATMENT OF LIQUID TOXIC WASTES, PART 1,
A. S Pearce, and S. E. Pearce.
Effluent and Water Treatment JOurnal, Vol. 15, No. 1, p 32, 37, 39, January, 1975. 5 fig, 6 tab.

Descriptors: *Biological treatment, *Liquid wastes, *Steel, Iron, Oil wastes, *Industrial wastes, *Waste water treatment, Toxicity, Activated sludge, Phenols, Bacteria.
Identifiers: *Coke plant effluents, Iron and steel wastes.

Effluents from the iron and steel industry can contain oils, greases, acids and solids, and toxic and noxious substances, such as cyanide, thiocyanide, thiosulfate phenols, cresols, ammonium salts, and sulfides. Biological treatment has been shown to be an effective method of reducing the toxic and noxious components to acceptable levels for discharge. The effluents considered in this paper are associated with the production of coke and contain both free and fixed ammonia, cyanide, thiocyanide, phenols, ferrocyanides, thiosulfates, sulfide, and chlorides, and have an alkaline pH. The various constituents, concentrations and volumes involved and the design parameters and equipment used in the biological treatment of liquid toxic wastes are discussed. Previously used methods of treatment are briefly mentioned. Percolating filters and activated sludge tanks are the primary methods of biological oxidation of carbonization effluents. The actual mechanisms by which the contaminating substances are removed are outlined. Two strains of bacteria have been isolated which are capable of growth on phenol and another strain has been isolated which can grow on thiocyanate. These three strains of bacteria are considered responsible for the degradation of the major part of coke plant effluents. (Orr-FIRL)
W76-05283

EFFLUENT CONTROL IN ZINC BONDERIZING PROCESSES: I. THE RECYCLE OF RINSE WATERS VIA AN ION EXCHANGE PROCESS,
Puricons, Inc., Berwyn, Pa.
F. X. McGarvey, and S. A. Fisher.
Plating, Vol. 62, No. 3, p 231-234, March, 1975. 7 fig, 4 tab, 2 ref.

Descriptors: *Metals, *Industrial wastes, *Recycling, *Waste water treatment, Zinc, Cations, Anions, Alkalinity, Ion exchange, Waste disposal, Cation exchange.
Identifiers: *Zinc bonderizing processes, Alkahline cleaner rinse waters, Cation exchange resins.

Conventional processes for the recycling of zinc phosphate and alkaline cleaner rinse waters from zinc bonderizing entail problems of waste disposal and water conservation. Recycle of rinse waters requires that both cations and anions be removed from the water. The two rinse waters, zinc phosphate and alkaline cleaner, have individual pollution potentials. Recycle of zinc phosphate rinse water is accomplished using strongly acidic sulfonic acid cation exchange resins; in the hydrogen cycle sulfuric acid acts as the regenerative solution. The acidic components in the cation effluent are then neutralized and concentrated. For recycle of alkaline rinse, effluents from the cation column are fed to weak base ion resins and a process similar to the zinc rinse recycle is carried out. These ion exchange processes thus constitute a means of concentrating dilute wastes produced from the rinsing operation of the zinc bonderizing process. This permits both water recycle and the elimination of the pollution potential of both zinc and phosphates. By using a strong acid cation exchange resin in the hydrogen form followed by a weak base anion exchange material, a 75-fold reduction in waste volume can be achieved and good quality waterproduced for reuse in the rinsing system. (ORR-FIRL)
W76-05284

PROBLEMS OF GALVANIC WASTEWATER PURIFICATION IN CLOSED WATER CYCLE (PROBLEMY OCZYSZCANIA SCIEKOW GALWANIZERSKICH W ZAMKNIETYM OBIEGU WODNYM),
W. M. Dobrowolski, B. Jakuszewski, and J. Grabowski.
Gaz, Woda i Technika Sanitarna, Vol. 49, No. 1, p 27-32, January, 1975. 4 fig, 7 tab.

Descriptors: *Waste water treatment, *Laboratory tests, Industrial wastes, Demineralization, *Lecycling, Zeolites, Ion exchange, Metals.
Identifiers: *Galvanic waste water, *Ionites.

Test data from bench studies conducted from 1966 to 1968, using ionites for purification of galvanic waste waters in closed water cycles, are presented. The ionites used during the research were Wofatites KPS, F, SBK, SBW, and Zerolites M and FF 530. Moisture was determined in the ionites by drying them to constandt weight at 60 C. Waste water was passed through an ionite stratum with a 25 cu cm/minconstant velocity. The waste water was then placed in a container with the reagent typical for the given ion. The dynamic exchange capability was determined on the basis of ion concentration and capacity. To determine statistical exchange capability, 5 g ionite were flooded with the waste water under study for 24 hrs, and calculations were based on the difference between initial solution concentration and after sorption in cu dm/kg dry ionite. Regeneration of chromium in acid waste water, of cationites, and purification of waste water derived from auxiliary processing are discussed. The technological purificastion processes concerning salvaging of water and the salts of copper, nickel, zinc, and chromium are described and illustrated. The recovery of metals is not economically feasible, since the quantities of metal in auxiliary waste water are insignificant. An interesting part of the process is the recuperation of water. For that purpose, the auxiliary waste water is directed to a column filled with cationite linked with a column filled with anionite. The water is demineralized.

The reagents regenerating the ionites are aqueous solutions of sodium hydroxide and hydrochloric acid. The water and some electrolites recovered are then used for supplementing galvanic baths. (Takacs-FIRL)
W76-05285

LABORATORY AND PILOT EXPERIMENTS ON THE ANODIC OXIDATION OF CYANIDE IN GALVANIZING WASTE WATERS (VERSUCHE IM LABOR UND IM HALBTECHNISCHEN MASSTAB ZUR ANODISCHEN OXIDATION DES CYANIDS IN GALVANISCHEN ABWASSERN),
H. Herkelmann, and P. Koppe.
Vom Wasser, No. 24, p 241-270, 1974. 17 fig, 11 tab, 16 ref.

Descriptors: *Metals, *Oxidation, *Electrolysis, *Waste water treatment, *Industrial wastes, Power, Hydrogen ion concentration, Laboratory tests, Pilot plants, Treatment facilities.
Identifiers: *Galvanizing waste water, *Cyanides, *Electrolytic oxidation, Anodic oxidation.

The electrolytic oxidation of cyanide in galvanic waste water was studied in laboratory-scale and pilot-scale experiments. Sodium chloride and hydrochloric acid in the form of usedpickling bath were added to achieve electrolytic oxidation. A rapid decrease of the cyanide concentration during the initial phase of the electrolytic oxidation to nitrogen and carbon dioxide was noted. The specific power consumption amounted to 27 kWh/kg cyanide, while higher values around 37 kWh/kg were measured during the oxidation of cyanide concentrates. Nonferrous metals were found to be separated almost quantitatively on the graphite electrodes. The specific power consumption decreased with decreasing pH value of the bath as well as with increasing initial cyanide concentration. Sodium chloride, added in the final phase of the electrolytic oxidation, suppressed undesirable secondary reactions, and thus may be used to reduce the costs of the treatment. The anodic oxidation of cyanide was found to be economically feasible in a narrow concentration range. (Takacs-FIRL)
W76-05286

THE PURIFICATION OF GALVANIC AND OTHER WASTE WATERS BY THE OZONIZATION METHOD (DIE REINIGUNG GALVANISCHER UND ANDERER ABWASSER NACH DEM OZONISER-VERFAHREN),
C. Fabjan.
Galvanotechnik, Vol. 66, No. 2, p 101-107, 1975. 11 fig, 13 tab, 20 ref.

Descriptors: *Ozone, *Waste water treatment, *Industrial wastes, *Metals, Oil wastes, Detergents, Oxidation, Iron, Manganese, Nitrates.
Identifiers: Galvanic waste waters, Cyanides.

Various uses of ozone for the purification of galvanic and other waste waters are described. Ozone is efficient in the detoxification of cyanide-containing galvanic waste waters. Cyanide reacts with ozone to form cyanate, a considerably less harmful compound, which is further hydrolyzed to carbon dioxide and ammonium ion at low pH values. The formation of nitrogen, carbon dioxide, ammonium carbonate, and urea was observed during practical ozonization of cyanide-containing waste waters. For the ozonization of concentrated cyanide solutions, ozone should be generated from oxygen rather than from air. Ozone is used on a full scale for the treatment of waste waters containing cyanides, phenol, oil residues, detergents, sulfides, sulfites, and for the oxidation of iron and manganese compounds, as well as nitrates. (Takacs-FIRL)
W76-05287

DECOLORIZE KRAFT BLEACH PLANT EFFLUENTS EFFECTIVELY WITH LOW-COST POLYMERIC ADSORPTION METHOD,
Rohm and Haas Co., Philadelphia, Pa.
S. I. Rock, A. Bruner, and D. C. Kennedy.
Pulp and Paper International, Vol. 17, No. 2, p 66-69, March, 1975. 4 fig, 5 tab, 6 ref.

Descriptors: *Pulp wastes, Pulp and paper industry, *Industrial wastes, *Waste water treatment, Polymers, *Adsorption, *Color, Capital costs, Operating costs, Effluents.
Identifiers: Amberlite XAD-8, Kraft bleach plant effluents, *Color removal, *Polymeric adsorbents.

A one-step process based on the polymeric adsorbent Amberlite XAD-8 has been developed by Rohm and Haas to remove color from kraft bleach plant effluents. This technique has advantages over the conventional lime or ion exchange methods in terms both of cost and performance. The only limitation to the process is that the stream to be decolorized must have a pH below 3.0; this may be achieved by blending the caustic extraction stream with an acidic chlorination effluent. Spherical beads of porous polymer function as the adsorbent by attracting organics to their surface by van der Waal's forces. The polymeric adsorption system is capable of treating the entire plant effluent, not only the caustic extraction stream. Total effluent decolorization is 90 to 95%, compared to the 70% decolorization achieved by other processes. Capital costs and operating costs for Amberlite XAD-8, massive-lime, mini-lime, and ion exchange treatments are compared. On the basis of total projected operating costs (dollars/sh. ton pulp) the polymeric adsorption process is the most economical. (Orr-FIRL)
W76-05288

ADSORPTION TREATMENT OF KRAFT PULP LIGNIN WASTE WITH SYNTHETIC, POLYMERIC ADSORBENTS, (IN JAPANESE),
National Research Inst. for Pollution and Research, Tokyo (Japan).
M. Komori, T. Nakai, O. Katsuki, and K. Urano.
Kami Pa Gikyoshi, (Journal of the Japanese Technical Association of Pulp and Paper Industry), Vol. 29, No. 1, p 45-52, January, 1975.

Descriptors: Pulp and paper industry, *Polymers, *Adsorption, *Waste water treatment, *Pulp wastes, *Industrial wastes, Flocculation, Activated carbon.
Identifiers: Kraft pulp lignins, *Polymeric adsorbents, Regeneration.

The treatment of kraft pulp lignin waste by adsorption onto five different types of synthetic polymeric adsorbents and two types of activated carbons was investigated. In addition, aluminum sulfate flocculation treatment was studied. The adsorption capacities of the polymeric adsorbents were found to be greater than or equal to those of the activated carbons. The adsorption rates of the polymeric adsorbents were also found to be equal to or more rapid than those of the activated carbons. The large part of the molecule of lignin was not adsorbed by the polymeric adsorbents but was easily removed by aluminum sulfate flocculation. The regenerative capacities of the polymeric adsorbents were demonstrated by the ease of desorption of the lignin by alkaline solution or methyl alcohol. (Katayama-FIRL)
W76-05289

CLOSED SYSTEM FOR WASTE WATER IN METAL SURFACE PROCESSING FACTORY, (IN JAPANESE),
J. Sakagami, and M. Fujii.
Kankyo Gijutsu, (Environmental Conservation Engineering), Vol. 4, No. 3, p 27-34, 1975. 5 fig, 8 tab.

Descriptors: Metals, *Waste water treatment, *Treatment facilities, *Industrial wastes, *Chemical precipitation, Ion exchange, Operating costs, *Recycling, Electrodialysis, Desalination, Evaporation.
Identifiers: *Metal plating wastes, Zero discharge, Metal surface processing, Japan.

A zero discharge/closed waste water system for metal surface processing factories is described. The system of the Japan Electric Company's Kakegawa plant which processes metal plating for telephone equipment consists of chemical treatment for metal recovery, concentration, and production of clean water. The plant waste water is first treated chemically to decompose harmful substances and to precipitate metals as metal hydrates; the sludge produced is disposed of at a mountain or in concrete form. The second process is the concentration of the salts content in the water by electrodialysis. The de-salted water is sent to an ion exchange apparatus producing clean water. The concentrated salt water (200 ppm salts) is sent to an evaporator to crystalize substances. The evaporated water is cooled by a condenser. The clean water obtained through ion exchange and evaporation is recycled to the factory manufacturing process. The plant recycles nearly 100 percent of its waste water: the waste water produced was 1877.2 cu m/month; and, the water recycled was 1853.6 cu m/month. The operational cost for the waste water treatment was reduced by utilizing the closed system from 36 cents to 27 cents for treating one cu m waste water. (Katayama-FIRL)
W76-05290

WATER PURIFICATION TECHNOLOGIES, (IN JAPANESE),
M. Inoue.
Kagaku Kojo, (Chemical Plant), Vol. 19, No. 1, p 82-86, January, 1975. 3 fig, 2 tab, 3 ref.

Descriptors: *Potable water, *Industrial water, *Water reuse, Industrial wastes, Municipal wastes, Pilot plants, Chemical wastes, Chemical industry, Activated sludge, Activated carbon, Electrodialysis, Reverse osmosis, Desalination.
Identifiers: Ethylene manufacturing wastes.

For the conservation of both potable and industrial water, reuse and purification of industrial and municipal waste waters will be necessary in the future in addition to the desalination of sea water. However, these processes are still costly and thus not attractive. Several purification techniques to treat industrial waste water for reuse for industrial purposes are being studied. A pilot plant to purify waste water from an ethylene manufacturing plant was installed and operated experimentally in Kawasaki City, Japan. The process involves activated sludge treatment to remove suspended materials followed by activated carbon treatment to remove dissolved organic compounds. The dissolved inorganic compounds are further removed by an osmotic method and electrodialysis. The quality of this treated waste water has not yet been determined to see if it compares favorably with the quality of raw water sources. (Katayama-FIRL)
W76-05291

WATER QUALITY AND THE TEXTILE INDUSTRY,
Cosgrove (W. J.) and Associates, Inc., Montreal (Quebec).
J. J. Boudreau.
American Water Works Association Journal, Vol. 67, No. 2, p 59-60, February, 1975.

Descriptors: *Pulp wastes, Textiles, *Industrial wastes, *Reviews, *Water quality control, Waste water treatment, *Water reuse, Costs, Water supply, Turbidity, Alkalinity, Recycling.
Identifiers: *Textile industry wastes.

A review is given of water quality problems central to the textile industry. These involve: producing water suitable for the processing pf textile

products; supplying water suitable for boiler feed in power plants; and, preventing corrosion in metal tanks and pipe lines. Many of the textile industry's processes require water of a high grade and known quality. Impurities which must be controlled are classified under turbidity and color, iron and manganese, alkalinity, and hardness. Combined treatment systems for small municipalities and local textile mills are suggested as being practical and economical. Some forms of water reuse will reduce the costs of process water. Appropriate methods forrecycle are dependent upon the costs of water and of effluent disposal, the limitation on water supplies, and the local conditions. Costs of overall water supply and effluent treatment are becoming undifferentiated and the objective of future research should be to determine the degree of water treatment required in the municipal plant that results in the lowest total cost of treatment. (Orr-FIRL)
W76-05292

WOOL SCOUR WASTE TREATMENT.
South African Patent AZ 7309-213. Issued September 20, 1974. Derwent French Patent Abstracts, Vol. V, No. 47, p D4, December, 1974.

Descriptors: *Patents, *Waste water treatment, *Industrial wastes, *Recycling, Detergents, *Polyelectrolytes, Solids removal, Separation techniques, *Flocculation.
Identifiers: *Wool liquor scouring.

A patent has been granted for a process for the purification of waste water from the scouring of raw or slipe wool. The aqueous soap or synthetic detergent solution is treated by removing the partially spent liquor from the scour bowl and adding a dilute aqueous solution of a nonionic or cationic polyelectrolyte. The treated liquor is held in a separation stage to allow flocculation and subsequent solids separation to take place. The separated solids are removed and the clarified liquor is recycled or discharged. (Orr-FIRL)
W76-05293

WASTE-TREATMENT APPLICATIONS OF REVERSE OSMOSIS,
General Atomic Co., San Diego, Calif. Roga Systems Div.
J. E. Cruver.
Transactions of the ASME, Journal of Engineering for Industry, Vol. 27, No.B-1, p 246-251, February, 1975. 4 fig, 6 tab, 5 ref.

Descriptors: *Reverse osmosis, *Waste water treatment, *Industrial wastes, Filtration, Separation techniques, Economics, Costs, Membrane processes, Desalination, Treatment facilities.

Reverse osmosis has two important characteristics which make it useful for both industrial and municipal effluent treatment. The first is its filtration ability, which facilitates the removal of essentially all of the suspended matter, turbidity, bacteria, and viruses in a waste stream. The second is the membrane's ability to separate dissolved organics and salts from water. Reverse osmosis should be used in a waste treatment system when any of the following conditions are met: a reduction in the volume of the waste water or increases in the efficiency of further processing are required; recovery of valuable or reusable materials is possible from the concentrated phase; or, water conservation is required or economical. Reverse osmosis is a feasible method for treating industrial effluents. A 820,00 gpd plant is described that has been designed to treat effluent from a metal processing plant. A variety of water reuse and pollution concentration possibilities exist in the textile industry, where dyeing wastes are rejected well by reverse osmosis membranes. A reverse osmosis filter, consisting of a skinned cellulose acetate membrane wrapped in a spiral configuration, has also been developed for the treatment of oily water from the bilges of ships. Other industrial wastes which may prove to be treatable by reverse osmosis systems include pulp and paper wastes and blowdowns from cooling towers and boilers. In addition, reverse osmosis appears to be uniquely suited for treating municipal waste water for recycling; pilot plant studies in California are detailed. Costs of reverse osmosis waste treatment systems vary according to the feed water characteristics; these variations are discussed. (Orr-FIRL)
W76-05294

MEETING EPA STANDARDS WITH REVERSE OSMOSIS,
Universal Oil Products Co., Del Mar, Calif. Roga Div.
M. Jhawar, and J. H. Sleigh.
Textile Industries, Vol. 9, No. 1, p 60-63, January, 1975. 3 fig, 1 tab.

Descriptors: *Industrial wastes, *Waste water treatment, *Reserve osmosis, *Activated carbon, Treatment facilities, Textiles, Standards, Costs, Color, Recycling, *Water quality standards.
Identifiers: Dissolved solids, *Dye color removal.

The textile industry must soon find the technology which will allow it to meet the EPA standards for effluent discharge. The only two technological approaches that may offer economical solutions are carbon absorption and reverse osmosis. Although carbon absorption requires an expensive capital investment, its operating costs are relatively low. However, carbon absorption will not remove dissolved solids to a sufficient degree to meet EPA standards and most state laws. Reverse osmosis is capable of removing dye colors and 95 percent of the total dissolved solids, and with proper engineering is the lowest cost solution to the textile industry's water pollution problem. The operating costs of a one mgd reverse osmosis system are typically 35-40 cents/thousand gallons of water. If the water is recycled, then the costs of meeting the new water pollution standards can be substantially reduced. Recycling of waste water will reduce the costs of obtaining water for the processes and will also save on fuel costs as the recycled water may be already as much as 50 degrees warmer than the typical raw feedwater. The results of two pilot systems, installed by Roga Division, UOP Company, in textile plants in Pennsylvania and California demonstrated the effectiveness of the reverse osmosis system in removing dissolved solids and dye colors. Although reverse osmosis has been proven a viable method of treating textile plant waste water, it should be remembered that there is no packaged solution equally applicable for every plant. For each given plant the waste treatment system must be custom designed. (Orr-FIRL)
W76-05295

REVERSE OSMOSIS IN INDUSTRIAL WATER TREATMENT,
Permutit Co., London (England).
W. J. Robertson.
Water Services, Vol. 79, No. 947, January, 1975. 3 fig.

Descriptors: *Reverse osmosis, *Metals, *Industrial wastes, *Industrial water, Membrane processes, Economics, *Waste water treatment, Costs, *Recycling.
Identifiers: Electroplating wastes, Metals recovery.

A general review is presented of the use of reverse osmosis in industrial water treatment. Reverse osmosis, RO, is a membrane process in which water is forced through a membrane by pressure, separating the solution into dilute and concentrate parts. The characteristics of the membrane are the important factors. Current membrane systems are asymmetric; the membrane itself is a layer of dense polymer only a few angstroms thick formed on top of a porous substrate in a single casting process. Cellulose acetate membranes are usually around 0.1 mm thick. The aromatic polyamide membrane is in the form of a fine hollow fiber with a diameter of 0.08 mm and a bore of 0.04 mm. Cellulose acetate systems are available in various geometries, such as tubular, flat sheet, spiral wound flat sheet, and membranes on porous rods. All RO systems are 'clean' water systems and therefore require pretreatment of the water to be fed to a RO system in order to permit effective long term functioning of the membrane. Reverse osmosis is used in the production of ultra-pure water (resistivity 18 mega-ohms), in the treatment of boiler-feed and process water, for deionization of water for hospitals, in soft drink manufacture, and in electroplating metal recovery. In metal recovery, the plating bath drag-out is concentrated by passage through a RO system. The object is to collect the concentrate which can be passed back to the plating bath directly. This is beneficial both economically and environmentally, as it conserves metal and eliminates the pollution that would occur if the metals were released in the effluent. (Orr-FIRL)
W76-05296

EXPERIENCE IN TREATING SCOURING EFFLUENTS,
B. R. Evans.
International Dyer and Textile Printer, Vol. 153, No. 1, p23-24, January 10, 1975.

Descriptors: *Waste water treatment, *Electrolysis, *Sludge treatment, Electrodes, Industrial wastes, Coagulation, Temperature, Separation techniques.
Identifiers: *Electroflotation, *Wool scouring wastes, *Yarn liquors.

Scouring wool and yarn liquors are treated by the electro-flotation technique, based on passing low-voltage currents through the effluent itself by means of metallic electrodes immersed in the liquor arranged horizontally along the bottom of the tank. The electrolytic tank, in addition to the electrodes, also contains a sludge removal system consisting of a mechanical flight-type scraper to remove sludge from the surface of the liquor and a hopper and sludge removal valve to remove the heavy sludge components at the bottom of the tank. When a low-voltage current is passed through the effluent, there is released at the electrode surfaces a mass of fine bubbles which, as they rise through the liquor, attach themselves to particles in suspension, forming a scum on the surface. Gas bubbles generated at the voltages normally used are about 0.1-0.5 mm in diameter and form an even mat throughout the length of the electrolytic tank, providing a very efficient action in floating suspended solids to the surface. The sludge produced in this type of separation system is dependent on the fraction removed by the scraper blade as it moves across the top of the tank. When acid-cracked grease-bearing liquors originating from an alkaline scour were treated, the electro-flotation technique was able to reduce the grease level to below 200 mg/liter if neutralization was performed first. Wastes from a scouring process in which detergent of a non-ionic variety were used were more difficult to treat. Treatment was obtained only with large quantities of coagulant. This increased the cost of treatment and caused sludge disposal problems. If pH, coagulant, current density, retention time and temperature were all held within set limits, then successful treatment of these more difficult wastes could be achieved at reasonable cost. (Orr-FIRL)
W76-05297

CONTROLLING PH IN WASTE STREAMS: PART I--DESIGNING THE TREATMENT FACILITY,
Foxboro Co., Mass.
D. L. Hoyle.
Plant Engineering, Vol. 29, No. 2, p 125-128, January, 1975. 4 fig.

Descriptors: *Liquid wastes, *Industrial wastes, *Waste water treatment, *Treatment facilities, Design criteria, *Hydrogen ion concentration, Control systems, Design standards, Water pollution control.
Identifiers: pIon.

Accurate and efficient control of hydrogen and other ion concentrations is central to the effective treatment of liquid wastes. This first article of a two-part series on controlling pH in industrial waste streams deals with designing the treatment facility. The relationship between pH range and quantity of reagent required to achieve strong acid, strong base neutralization is based on a logarithmic progression. Therefore, small errors in dosage, such as one percent too much or too little, result in large errors in pH control. Means must be found to compensate for the inevitable errors in reagent delivery; process gain must be reduced so that the effect of error is lessened. Many of the problems in industry are solved by the application of an appropriate control system to the existing process. In most cases, a minimum of one well-stirred tank is required to obtain satisfactory performance for difficult pH or pIon control applications. Intermixing and backmixing are important to a control system; backmixing is more important to accurate pH control than intermixing. The best way to define backmixing for pH control purposes is by the ratio of the system deadtime to retention time of the neutralization vessel. Suitable baffles and careful agitator positioning in neutralization vessels will prevent a whirlpool effect. Inlets and outlets should be located on opposite sides of the neutralization vessels with the inlet at the top and the outlet near the bottom. Variation in the position of theinlet and outlet can greatly change the deadtime. The ideal neutralization vessel should have approximately cubic dimensions and be large enough to provide for a retention time of not less than three minutes. (See also W76-05299) (Orr-FIRL)
W76-05298

CONTROLLING PH IN WASTE STREAMS: PART II--OBTAINING CONSISTENT RESULTS,
Foxboro Co., Mass.
D. L. Hoyle.
Plant Engineering Vol. 29, No. 5, p 75-77, March, 1975. 4 fig, 1 tab.

Descriptors: *Liquid wastes, *Industrial wastes, *Waste water treatment, *Control systems, Measurement, Treatment facilities, Design criteria, *Hydrogen ion concentration, Water pollution control, Design standards.
Identifiers: pH control.

This second article in a two-part series on controlling pH in industrial waste streams deals with obtaining consistent results. The control system, reagent selection, lagoons, typical system designs, and applications are discussed. In addition to a properly designed process equipment and control system, a well-trained operator is essential for good process control and can help to minimize operating costs. The most useful advanced control technique is feedforward control. In this technique, measurements of process variables are made upstream of the neutralization facility and used to determine the reagent requirements. The proper amounts of the reagents are then added directly to the influent stream. The best reagents to choose are those that have the lowest overall cost in terms of the cost of the reagent, expense of maintaining the reagent system, and the cost of the facilities required to use the reagent. A lagoon installed upstream from a stirred neutralization tank can be very useful. It helps stabilize upsets in influent pH and flow and allows the use of a process feedback system instead of the more expensive feedforward control system. However, a lagoon cannot replace a mixing vessel as part of the control system. The use of feedforward control systems and applications are illustrated by schematic drawings and graphs. (See also W76-05298) (Orr-FIRL)
W76-05299

METHOD OF ELECTROLYTIC TREATMENT OF WASTE WATER,
M. Ichiki, and I. Masahito.
Canadian Patent 958,373. Issued November 26, 1974. Patent Office Record, Vol. 102, No. 48, p 47, November, 1974.

Descriptors: *Patents, *Electrolysis, *Industrial wastes, *Waste water treatment, Scum, Cathodes, Anodes, Separation techniques.

A new method for the electrolytic treatment of industrial waste water has been patented. The electrolysis is performed by introducing the industrial waste water as the electrolyte into an electrolytic cell equipped with vertically suspended anodes and cathodes positioned horizontally near the bottom of the cell. Scum forms from the electrolysis of heavy metal ions, fats and oil including animal, vegetable and mineral oils and/or various fine, solid floating material. This scum is removed from the upper part of the electrolytic cell; the electrolytically purified waste water is removed from the lower part of the electrolytic cell. (Orr-FIRL)
W76-05300

TREATMENT OF PAPER BOX PLANT EFFLUENTS,
Owens-Illinois, Inc., Toledo, Ohio. (Assignee).
S. A. Hider, J. K. Rogers, and C. W. Wilkins.
United States Patent 3,868,320. Issued February 25, 1975. Official Gazette of the United States Patent Office, Vol. 931, No. 4, p 1645, February, 1975.

Descriptors: *Patents, Pulp and paper industry, *Industrial wastes, Effluents, Flocculation, Metals, Separation techniques, *Waste water treatment, *Pulp wastes.
Identifiers: Starch adhesive effluents, Paper box plant wastes.

A method of clarifying an aqueous, starch adhesive effluent from a paper box plant has been patented. The aqueous flexographic ink effluent containing about 40 to 50 percent by weight maleic or acrylic vehicle is combined with 15 to 40 percent by weight pigment to form a mixture containing about 8 to 12 parts starch solids to one part ink solids. The resultant mixture is flocculated with a multivalent metal compound. The metal compound is chosen from the group consisting of calcium oxide, calcium hydroxide, calcium chloride, magnesium oxide, magnesium hydroxide, aluminum sulfate or ferrous sulfate. The selected compound is added in a weight ratio of 0.1 to 1.0 parts compound to one part ink-starch solids. The final step involves separating the flocculated solids that have formed. (Orr-FIRL)
W76-05302

BIOCHEMICAL AND CHEMICAL OXYGEN DEMANDS OF CARBOHYDRATES WITH DIFFERENT DEGREES OF POLYMERIZATION,
Swedish Forest Products Research Labs., Stockholm.
S. A. Larsson, B. A-L. Ostman, and E. L. Back.
Environmental Science and Technology, Vol. 9, No. 2, p 160-162, February, 1975. 2 fig, 1 tab, 12 ref.

Descriptors: *Chemical oxygen demand, Pulp and paper industry, *Biodegradation, *Waste water treatment, Polymers, *Biochemical oxygen demand, *Pulp wastes, Oxidation, *Carbohydrates, Industrial wastes.
Identifiers: *Polymerization.

The rapid biochemical degradation of carbohydrates, such as a high BOD in effluents from pulp and paper industries, may be a disadvantage in that it causes a rapid lowering of the oxygen content of the water system near the mill. However, it may also be an advantage in that less time of treatment is required when aerated ponds or activated sludge treatment are used. The biochemical and chemical oxygen demands of carbohydrates have been demonstrated to depend on the degree of polymerization. Monosaccharides are degraded more rapidly and have a higher BOD5 per unit mass than polysaccharides. This lag in the BOD between disaccharides and their monosaccharides is due to the existence of the bond holding the two monosaccharides. The objective of this paper was to illustrate the differences in BOD by an analysis of the biochemical and chemical degradation of some pure components of pulp and paper effluents. A comparison of xylose with a xylan from birch (DP 200) and galacturonic acid with polygalacturonic acid (DP 80) was made. The polymers have a lower and slower BOD and a lower COD, particularly if the COD is determined by the permanganate method. The dichromate method gives a higher degree of oxidation and is less dependent on the molecualr weight. (Orr-FIRL)
W76-05303

FIGHT FLOATABLES WITH CHEMICALS,
Gannett, Fleming, Corddry and Carpenter, Inc., Harrisburg, Pa. Applied Science Group.
A. C. Gray, Jr.
Water and Wastes Engineering, Vol. 12, No. 1, p 33-38, January, 1975. 2 fig, 2 tab.

Descriptors: *Separation techniques, *Oil wastes, *Oil industry, Industrial wastes, Food processing industry, Metals, *Waste water treatment, Activated carbon, Coagulation, Chemical precipitation, *Flotation.
Identifiers: Grease, *Dissolved air flotation.

The three major producers of oil- and grease-containing waste waters are petroleum refineries, metals manufacture, and food processors. All of these industries face problems of how to handle their floatables. Only a limited amount of oil and flotables can be handled by municipal treatment systems, necessitating that pretreatment be performed by industry. The number of methods in use for the removal of oil and grease compounds include mechanical skimming after quiescent detention for removing the free oil, and chemical, biological, and physical mechanisms for the removal of soluble oil. Selection of a treatment process involves considering the effluent quality desired, treatment systems which will follow oil and grease removal, additional contaminants which must be eliminated from the wastes, and relative costs of the applicable system. Chemical coagulation, with activated carbon adsorption in some cases, together with dissolved air flotation of the coagulated solids is one flow scheme which is finding increasing application in the treatment of oil and grease containing industrial wastes, both for pretreatment and direct discharge. The most commonly used coagulants in waste treatment are lime, aluminum sulfate, and ferric chloride. Most of the heavy metals, currently of prime concern, can be removed with lime as the precipitating reagent. However, cadmium and mercury removal may require the addition of sodium sulfide, while lead removal seems to require the use of soda ash. Since coagulation of oil and grease containing wastes often results in the formation of a floc which settles slowly or has a tendency to float, flotation has been demonstrated to be a good method of clarification. (Orr-FIRL)
W76-05305

OIL-WATER SEPARATOR.
For primary bibliographic entry see Field 5G.
W76-05306

MIXED-MEDIA FILTRATION OF OILY WASTE WATERS,
Neptune Microfloc, Inc., Corvallis, Oreg.
R. H. Evers.

Journal of Petroleum Technology, Vol. 27, No. 2, p 157r163, February, 1975. 9 fig, 5 ref.

Descriptors: *Filtration, *Waste water treatment, *Oil wastes, *Oil industry, Filters, Design, Equipment, Coagulation.
Identifiers: *Mixed-media filtration, Petroleum industry.

The petroleum industry is concerned with improving the quality of injection waters in secondary recovery operations and with reducing the biochemical oxygen demand, oil, and suspended solids levels in refinery waste waters. The development, uses, and application to the petroleum industry of mixed-media filtration are discussed. A mixed-media filter uses three or more materials, each of different size and density, that intermix, rather than stratify, to form a filter grading from coarse at the top to fine at the bottom in the direction of flow. A typical mixed-media filter will contain anthracite coal, silica sand, and garnet sand. Mixed-media filtration has been used to purify oilfield produced water, oil refinery wastes, ballast waste from cargo oil tankers, and other systems containing oil. The design of the mixed-media filter system for oily wastes depends on influent oil content, influent suspended solids content, desired effluent quality, temperature, space, and dependability of treatment. An advantage that mixed-media provides is that the size and quantity of wash filter material can be varied to meet the requirements of any particular situation. One of the major problems with the filtration of oily wastes is media fouling or 'mudballing.' This problem can be minimized by the use of a supplementary surface wash during the backwash cycle. Mixed-media filter systems have been shown to be effective in oily waste water filtration. Depending upon the particular waste water to be treated, the individual media sizes and filter depth can be varied, and the effect of chemical coagulants can be considered in the design of the system. (Orr-FIRL)
W76-05307

WASTE WATER CONTAINING SULPHIDE.
French Patent FR 2218-792. Issued October 18, 1974. Derwent French Patents Abstracts, Vol. V, No. 50, p D2, January, 1975.

Descriptors: *Sulfides, *Waste water treatment, *Oil, *Patents, *Oil wastes, *Industrial wastes, Waste disposal, Oxidation, Hydrogen sulfide, Organic compounds, Separation techniques.

The patented method described was designed for the treatment of waste water containing sulfides. The waste water is mixed with a hydrocarbon film in a weight ratio of 0.1 to 6.0. It is then partially oxidized with an oxygen rich gas in the reaction zone of a free-flow non-catalytic synthesis gas generator at 1500-3500 F and 1-250 atmospheres pressure. This yields an effluent of hydrogen, carbon monoxide, carbon dioxide, and water with minor amounts of H2S, CH4, N2, COS, and C particles. The preferred next step is to separate the carbon particles and recover the H2S from the synthesis gas leaving the separator. This process may be used to treat sour water and other water residues from petroleum refining and petrochemical manufacture. Disposing of the sulfide-free water into lakes and rivers causes less pollution than is associated with processes that strip sulfides from the water by air, steam or by oxidation to S203(2-). There is also less air pollution associated with this process. An additional benefit of the method is the destruction of PhOH. (Orr-FIRL)
W76-05308

REMOVAL OF HEAVY METALS FROM AQUEOUS SOLUTIONS,
A. E. Hatch.
United States Patent 3,859,210. Issued January 7, 1975. Official Gazette of the United States Patent Office, Vol. 930, No. 1, p 432, January, 1975.

Descriptors: *Patents, Metals, *Industrial wastes, *Mercury, *Polyelectrolytes, *Waste water treatment, Separation techniques, *Heavy metals.

A process for removing mercury from aqueous streams has been patented. The aqueous stream to be treated may contain mercury in ionic or in compound form. The initial step involves mixing the aqueous stream with a polyelectrolyte and particulate matter. The polyelectrolyte is selected from the group consisting of a polyalkylene polyamine and polyethylenimine and the particulate matter is chosen from the group consisting of a bentonite clay and sand. The mercury is then allowed to become bound to the particulate matter. The final step involves separating the particulate matter containing the mercury from the aqueous stream. (Orr-FIRL)
W76-05309

MANAGING INDUSTRIAL WASTE DISPOSAL,
Westinghouse Electric Corp., Pittsburgh, Pa.
B. A. Kerns, and W. G. Vaux.
American Machinist, Vol. 119, No. 1, p 46-49, January, 1975. 7 tab.

Descriptors: *Waste disposal, *Water pollution control, *Metals, *Industrial wastes, Solid wastes, Liquid wastes, Chemical wastes, Sludge treatment, Economics, Treatment facilities, Management.
Identifiers: *Waste management systems.

Westinghouse has designed a program to eliminate all forms of pollution at its plants and laboratories. Treatment of the company's solid and liquid wastes are the primary goals. These wastes include 51,000 tons of rubbish/year; 38,900 tons of metal scrap/year; 7,460 tons of paper/year; 5,480 tons of wood/year; 3,200 tons of lube and insulating oils/year; 2,600 tons of solvents/year; 2,130 tons of chemical sludge/year; and smaller amounts of cutting fluid, plastics, glass, PCB, and chemicals. The study is divided into three phases: Phase I is a comprehensive survey of all wastes from all plants; Phase II is a survey of existing and practical waste disposal methods; and, Phase III is a detailed evaluation of the most promising waste disposal methods and coordination of eventual treatment within and between regional plants. The preferred methods for handling the various wastes at Westinghouse Plants follow. Scrap metal is currently being sold on bid and this disposal method should remain the same. Dry chemicals are currently being disposed of by a licensed hauler on special pickups, this method should also remain unchanged. Scrap glass totals 75 tons annually. It is not practical to recover this and the glass should be included in the rubbish. Chemical sludge which results from treatment of metal finishing waters is presently too watery and should therefore be thickened and then disposed of at an approved landfill site. Conclusions from the study so far include: present disposal methods are not the most economical on a dollar or resource recovery basis; improved methods are available for improved disposal; waste disposal is primarily a management decision; and disposal of all waste must be considered as a total system. (Orr-FIRL)
W76-05310

WASTEWATER TREATMENT SYSTEM IN STEEL MILLS, (IN JAPANESE),
Y. Komatsu, S. Matsuno, and H. Fujita.
Hitachi Hyoron, (The Hitachi Hyoron), Vol. 56, No. 10, p 91-96, October, 1974. 11 fig, 1 tab.

Descriptors: Steel, *Industrial wastes, *Waste water treatment, *Recycling, *Filtration, Sedimentation, Treatment facilities, Water reuse, Filters.
Identifiers: Japan, *Steel mill wastes.

Described is a waste water treatment system used in steel mills in Japan. Because of the large volume of water used, from 100 to 200 cu m per ton of blister steel, it has been customary for a steel mill to own a waste water treatment system which provides for the reuse of the waste water. The described treatment system for waste water from a continuous caster is finding wide application in steel mills. A highly recommended process for waste water treatment consists of a combination of natural sedimentation and high speed filtering. Therefore, a high speed filter and a travelling and transversing type pump-up collector are employed. In an experiment using prototype treatment system of this type, very satisfactory results were obtained with respect to system performance. (Orr-FIRL)
W76-05311

TREATMENT OF WASTE OIL AT THE KEIHIN WORKS--NIPPON KOKAN,
Keihin Works, Kawasaki (Japan).
T. Ikehata.
Iron and Steel Engineer, Vol. 52, No. 1, p 65-70, February, 1975. 5 fig, 3 tab.

Descriptors: *Oil wastes, Steel, *Centrifugation, Water pollution, *Oil pollution, Liquid wastes, Sludge treatment, Treatment facilities, Equipment, Industrial wastes, *Waste water treatment, Water quality standards.
Identifiers: *Japan, *Steel plant wastes.

Steel plants are potential sources of serious pollution problems because of the offensive gases, dust and large quantities of waste water produced as well as many other wastes. The treatment of waste oil by incineration at the Keihin works of Nippon Kokan of Japan is discussed. Topics included the regulations covering waste oil treatment, the basic policy of the Keihin works, the generation of the waste oil from various parts of the works, the waste oil treatment facilities, features of the facilities, and some of the problems in waste oil treatment. The waste oil treatment facilities consist of the following: a liquid waste oil receiving and preparation center which comprises a centrifugal separator and a stationary separating tank; a dehydration plant for emulsion waste oil sludge, dehydrated cake and ash; mixing and charging facilities for oily sludge, dehydrated scum (cake) and cinders; a rotary incinerator and secondary combustion furnace; a fume scrubbing system and ash bunker; and, waste gas treating facilities comprising a gas cooler, electrostatic precipitator and blower. This system can easily treat waste oil with a high water content because of the dehydration equipment. For the treatment of sticky oily mud, mixing with ash is an advantage. This system also eliminates secondary pollution; water separated in the course of waste oil treatment and water from the waste gas cooler can not be discharged outside the works. A highly efficient, large capacity industrial waste treatment plant has been in operation since May 1973 at the Fukuyama works of Nippon Kokan. The plant was developed based on technology acquired at the Keihin works. (Orr-FIRL)
W76-05312

PURIFIER ESP. FOR ELECTRO PLATING EFFLUENT WATER.
French Patent FR 2216-233. Issued October 4, 1974. Derwent French Patents Abstracts, Vol. V, No. 48, p D3, January, 1975.

Descriptors: *Patents, *Waste water treatment, *Metals, *Industrial wastes, Equipment, Recycling.
Identifiers: *Electroplating wastes, *Batch treatment tanks, Cyanides.

The patented equipment described is a purifier designed especially for use with electroplating effluent water. The effluent water from an electroplating plant is treated to remove acid cyanides, along with other contaminants, in a batch treatment tank. The treatment tank has a short cycle of about ten minutes and a low capacity. After the

tank is filled from a sump, under level control, a pump is actuated to recycle water from the bottom to the top of the tank. The recirculation occurs via constrictions which induce the flow of additive reagents, such as NaOH, H2SO4, and Caro's acid, under pH and rH control. When the purification cycle is complete, another pump is actuated to empty the tank. The treated water is released to a drainage system. Surges in contaminant concentration, such as those due to process tank overflow, are more effectively accommodated with the new equipment than with continuous purifiers. (Orr-FIRL)
W76-05313

COMPLETE WATEREUSE, INDUSTRY'S OPPORTUNITY.
American Inst. of Chemical Engineers, New York.
National Conference on Complete WateReuse April 23-27, 1973, 728 p. Sponsored by: AICHE and Environmental Protection Agency, Washington, D.C. Technology Transfer. Edited by Lawrence K. Cecil.

Descriptors: *Water reuse, *Waste water treatment, Legal aspects, Water pollution control, *Water quality standards, Technology, Waste disposal, *Ultimate disposal, *Cost-benefit ratio, Water management(Applied), Administration, Industries, Benefits.
Identifiers: *Zero discharge, *Technology transfer.

The conference included sections on: a general overview of water reuse, especially the meaning of zero discharge; legal aspects of recent Federal water pollution legislation standards, and laws; future technology; waste disposal and ultimate disposal; the electric power industry; chemical manufacture; petroleum, pulp, paper and potatoes; the cost/benefit ratio; reuse in water management; and water administration benefits from reuse. (See W76-05315 thru W76-05318.)
W76-05314

THE RATIONALE OF ZERO DISCHARGE,
W. A. Parsons, and H. S. Azad.
In: Complete WateReuse: Industry's Opportunity, April 23-27, 1973, American Institute of Chemical Engineers and Environmental Protection Agency--Technology Transfer, p 34-36. 1 fig.

Descriptors: *Discharge(Water), *Water utilization, Water pollution control, Water pollution, Waste assimilative capacity, Natural resources, Water quality standards, Water pollution sources, Costs, Water reuse.
Identifiers: *Zero discharge.

Although the concept of zero discharge is not new, its application is original and is a subject of critical evaluation from the standpoint of consistency with environmental goals and federal funding. Factors contributing to the realization of a full measure of benefit from expenditures committed to waste water control are reviewed. Water pollution is the utilization of the assimilation capacity of a watercourse. Assimilation capacity is a natural resource similar to solar energy, water supply or mineral deposits. Use of the assimilative capacity should not be considered evil if obtaining the fullest health, wealth and enjoyment is the goal. The most efficient pollution programs will prosecute all sources of pollution simultaneously so that equal unit cost of pollution removal is effected. Programs of proven practicality should be chosen over costly installations of unproven reliability. Zero discharge can be applied to situations in which water quality criteria is sublime, the waste treatment is a severe problem, or waste heat is a problem. However, it is not a viable concept in a program featuring cost optimization. Secondary effects on the environment should be evaluated. Amendments of existing legislation are needed to enable the adoption of policies consistent with national goals of conservation of natural and economic resources. The benefits are a more rapid alleviation of problems at minimum cost. (See also W76-05314) (Pinto-FIRL)
W76-05315

CLEARING UP THINKING ON POLLUTION LAWS,
For primary bibliographic entry see Field 5G.
W76-05316

HANDLING OF SOLIDS AND LIQUID SIDESTREAMS RESULTING FROM WATEREUSE OPERATIONS,
Canys, Dresser and McKee, Inc., Boston, Mass.
A. A. Kalinske.
In: Complete WateReuse: Industry's Opportunity, April 23-27, 1973, American Institute of Chemical Engineers and Environmental Protection Agency--Technology Transfer, p 140-146. 25 ref.

Descriptors: *Water reuse, *Waste water treatment, *Waste treatment, *Ultimate disposal, *Water treatment, Activated sludge, Organic matter, Activated carbon, Treatment, Trickling filters, Sands, Filtration, Dewatering, Treatment facilities, Ion exchange, Chemical precipitation, Oxidation, Sludge, Cost analysis, Municipal wastes.
Identifiers: *Liquid sidestreams.

Waste water treatment processes should be considered as one step of water treatment processes. The eventual disposal of the solid and liquid pollutants and residues that are removed by various treatment processes are discussed. The basic ultimate disposal processes are discussed. Biological treatment by means of the activated sludge process can remove considerable amounts of biodegradable organic matter. The exact amount depends on the food to microorganism ratio and the type of organic matter that is present. Other methods include a rock trickling filter, rotating disc contactor and an aerated packer tower. Another process that reduces organic matter is adsorption onto activated carbon. The rapid sand filter has been used by municipal water treatment plants for almost seventy five years, and the basic design has remained unchanged. Chemical precipitation can be used to remove soluble inorganics. Ion exchange and membrane technology are other good methods for separating soluble matter. Chemical oxidation includes such methods as incineration of dewatered organic sludges or liquids, wet air oxidation of organic bearing liquid sidestreams and the removal of small amounts of soluble organics by ozone. Whatever treatment system is decided on, it is necessary that a detailed cost analysis be performed and the total cost must be obtained so that it may be compared to other possible methods. Other techniques that are being considered for the future include incineration of soluble organics in liquids, catalytic oxidation, hydrolysis of organic sludges, and the use of magnesium carbonate for coagulation. (See also W76-05314) (Pinto-FIRL)
W76-05317

MUNICIPAL WASTEWATER RECLAMATION--AN INDUSTRIAL WATER SUPPLY,
Dallas Reclamation Research Center, Tex.
A. C. Petrasek, S. E. Esmond, and H. W. Wolf.
In: Complete WateReuse: Industry's Opportunity, April 23-27, 1973, American Institute of Chemical Engineers and Environmental Protection Agency--Technology Transfer, p 689-703. 2 fig, 12 tab, 9 ref.

Descriptors: *Municipal wastes, *Industrial wastes, *Industrial water, *Reclaimed water, *Reclamation, *Water reuse, Treatment, Waste water treatment, Treatment facilities, Activated sludge, Activated carbon, Biological treatment, Effluents, Water requirements, Potable water.
Identifiers: Chemical treatment, Physical treatment.

Considerable reuse of municipal waters by industry is practiced at this time. Industrial water supply problems and requirements are reviewed. Water quality depends a great deal on whether it will be used as a coolant or as boiler feed. If used for cooling the waters must not deposit scale, corrode the systems, encourage the growth of slime, or deteriorate wood. Water used for boiling must be free from silica, aluminum, sodium, and potassium. Specific requirements are presented for the textile, lumber, paper, chemical, petroleum, metals, tanning, cement, and food and soft drink canning industries. Tests were performed at a treatment facility on two different treatment sequences. The biological-physical sequence included the following operations: screening and degritting; primary sedimentation; completely mixed activated sludge; multi-media filtration; and disinfection. The biological-physical-chemical sequence included: screening and degritting; primary sedimentation; completely mixed activated sludge; chemical treatment; multi-media filtration; activated carbon adsorption; and disinfection. Primary effluents, although not of high quality, have certain applications as cooling waters and in the lumber and metals industry. Activated sludge effluent can be used in the lumber, petroleum, metals, cement, and paper industries. When filtered, this water can be used also in the tanning industry. After filtering, this water can be used in finishing and rinsing processes. After activated carbon adsorption, the effluent is considered of excellent quality and the water can be used for all industries except those requiring potable water. (See also W76-05314) (Pinto-FIRL)
W76-05318

UPGRADING WASTEWATER STABILIZATION PONDS TO MEET NEW DISCHARGE STANDARDS.
Utah Water Research Lab., Logan.
Available from the National Technical Information Service, Springfield, Va 22161, as PB-240 402,$7.50 in paper copy, $2.25 in microfiche. Environmental Protection Agency, Report EPA-670/9-75-004, (March 1975), 244 p (Proceedings of a symposium held in November 1974). EPA 1BB043 (21ASR-119) R-803294-01-0.

Descriptors: *Waste water treatment, *Water quality standards, *Oxidation lagoons, *Filtration, Sewage treatment, Disinfection, Infiltration, Cost analysis, Algae, Waste disposal, Sprinkler irrigation, Lagoons.
Identifiers: -Sand filtration, Controlled discharge(Wastes), Rock filtration, Land disposal.

The question as to whether lagoons, as they now exist, meet the new secondary treatment standards and what methods would work to upgrade lagoon treatment in cases where they presently do not meet the standards is of high priority for many Regional Offices of EPA. The symposium was held for EPA staff and State Officials to review the Office of Research and Development's program for upgrading lagoons. The intermittent sand filter, land application of algae laden effluents and the submerged rock filter offer good potential for cost effective upgrading. The basic biology of the treatment mechanism, disinfection technology, the controlled discharge operation (and results), cost effective analysis, and new fields of research were covered. Intermittent sand filtration, submerged rock filtration, and land application of sewage effluents are effective alternatives to removing algae from sewage lagoons. (See W76-05320 thru W76-05324) (EPA)
W76-05319

CONSTRUCTION PROCEDURES AND REVIEW OF PLANS AND GRANT APPLICATIONS,
Brown and Caldwell, Walnut Creek, Calif.
W. R. Uhte.
In: Upgrading Wastewater Stabilization Ponds to Meet New Discharge Standards, August 21-23, 1974, Logan, Utah, Utah State University, p 21-29.

Descriptors: *Construction, *Lagoons, *Oxidation lagoons, *Waste water treatment, Stabilization, Design criteria, Engineering personnel, Ponds, Design, Operation and maintenance, Maintenance.
Identifiers: Design engineer, *Stabilization ponds.

General problems connected with waste water stabilization ponds and the design, construction, and operation considerations which are involved in federal and state review are discussed. Problems can arise when oxidation ponds are not designed properly, are not operated and maintained properly, and are not budgeted for and funded properly. Design considerations are the responsibility of the design engineer. Loading levels should be flexible to assure excessive summer organic loadings and winter hydraulic loading. Properly designed pond configuration involves recycling from four to eight times the average design flow into the system. Inlet and outlet hydraulics should be designed for peak wet weather flows. The system should be designed so that areas where scum tends to accumulate are eliminated. Pond and channel dikes are usually best when designed with side slopes between 6 horizontal to one vertical and 2 horizontal and one vertical. Boat launching ramps with all weather access, wash and toilet facilities, and laboratory and monitoring facilities should be built. For the construction of a pond, the contractor must be provided with a clear and concise set of drawings and specifications which complement each other. The design engineer should have the full responsibility for the resident engineer and the inspection of the project. The design engineer should provide an operation and maintenance manual which describes: the treatment processes; the physical layout; process testing; maintenance requirements; safety restrictions; and emergency procedures. Operation training programs, performance evaluations and user charges and self sufficiency may also be required of the design engineer. (See also W76-05319) (Pinto-FIRL)
W76-05320

SEPARATION OF ALGAE CELLS FROM WASTEWATER LAGOON EFFLUENTS BY SOIL MANTLE TREATMENT,
Utah State Univ., Logan. Div. of Environmental Engineering.
R. A. Gearheart, and E. J. Middlebrooks.
In: Upgrading Wastewater Stabilization Ponds to Meet New Discharge Standards, August 21-23, 1974, Logan, Utah, Utah State University, p 137-186. 6 fig, 24 tab, 204 ref. 1 app.

Descriptors: *Sewage treatment, *Waste water treatment, *Lagoons, Effluents, *Algae, *Soil treatment, Soil filters, Water quality standards, Stabilization, Planning, Biochemical oxygen demand, Toxicity, Ponds, Land, Irrigation, Cost analysis, Crops, Utah.
Identifiers: *Soil mantle treatment, Land planning, Utah Water Quality Standards.

A review of the history of sewage disposal by waste water irrigation or soil mantle disposal of lagoon effluent is presented. An experimental design of a soil mantle disposal system is described. The limitations of pond effluent used as irrigation water for crops were investigated. Land planning techniques to make ponds more visually pleasing are studied. The difference between Class C and Class D Utah Water Quality Standards are given. The most significant difference is in the 5 day biochemical oxygen demand (BOD(5)). Class D is 25 mg/liter and Class C is 5 mg/liter. Class C standards in general cannot be met by waste stabilization ponds. Economically, they are very feasible, so another means of disposing of the effluent is suggested, irrigation. Waste stabilization pond depth, detention time, shape, mixing and loading are discussed. Too often, land planning has been neglected. It should be based on the nature of the site, and the human purposes for which it will be used. Planning techniques should account for odor, mixing by wind action, insects, type of site, water table depth, and topography. The use of natural berms and trees to reduce odors and attract insect eating birds should be considered. The beneficial or toxic effects of salinity, alkalinity, and other elements are discussed. Water quality factors in relation to specific crops are summarized. Land requirements for effluent discharge are also considered. Some case histories on the use of effluents for irrigation are briefly presented. (See also W76-05319) (Pinto-FIRL)
W76-05321

LAGOON EFFLUENT SOLIDS CONTROL BY BIOLOGICAL HARVESTING,
Robert S. Kerr Environmental Research Lab., Ada, Okla.
W. R. Duffer.
In: Upgrading Wastewater Stabilization Ponds to Meet New Discharge Standards, August 21-23, 1974, Logan, Utah, Utah State University, p 187-190. 14 ref.

Descriptors: *Lagoons, *Suspended solids, Biocontrol, *Waste water treatment, Algae, Phytoplankton, Bacteria, Fish, Carp, Minnows, Channel catfish, Mollusks, Zooplankton, Food chains, Stabilization, Daphnia, Organic wastes, Aquatic life.
Identifiers: Talapia nilotica, *Biological harvesting, Bivalve mollusks.

Aerobic bacteria and algae are responsible for the stabilization of organic wastes in lagoons. Research has concentrated mostly on improving production of algae and phytoplankton, resulting in increased suspended solids concentrations, instead of trying to increase the bacteria population to consume the algae. Accomplishments of several studies oriented toward removal of phytoplankton by other aquatic organisms are reviewed. Problems associated with this biological harvesting are discussed, and research areas are suggested. Three types of organisms have been investigated: zooplankton, bivalve mollusks, and fish. Experiments that were performed using the zooplankton Daphnia indicated good suspended solids removal. Since the occurrence of this organism is very uncommon in waste water ponds, culture ponds requiring rigid control and extensive management must be considered. Experiments performed with bivalve mollusks have shown algae removals of up to 85%. The use of cultured fish, mostly carp, in China has been practiced for centuries as a method of purifying waters. Various efforts in the United States included the use of carp, fathead minnows, fingerling channel catfish, golden shiner minnows, and Talapia nilotica. The best approach to date for the removal of solids in oxidation ponds has been the food chain concept. Larger scale systems must be experimented with. Additional research efforts should include: extent of selective solids uptake; examination of a greater number of species; taking a multi-species approach; study of seasonal aspects; productivity of culture systems; and the potential for problems. (See also W76-05319) (Pinto-FIRL)
W76-05322

PROGRESS REPORT: BLUE SPRINGS LAGOON STUDY, BLUE SPRINGS, MISSOURI,
Environmental Protection Agency, Kansas City, Kans. Water Quality Lab.
C. M. Walter, and S. L. Bugbee.
In: Upgrading Wastewater Stabilization Ponds to Meet New Discharge Standards, August 21-23, 1974, Logan, Utah, Utah State University, p 191-197. 9 tab, 1 ref.

Descriptors: *Lagoons, Permits, *Regulation, Legislation, Standards, Suspended solids, Biochemical oxygen demand, Coliforms, *Waste water treatment, Chemical analyses, Sands, Filters, *Missouri, Federal Government, Discharge(Water), Water quality standards, Sewage treatment.
Identifiers: Blue Springs(Mo), Fecal coliforms, Three cell series operated lagoon, Federal Water Pollution Control Amendments, National Pollutant Discharge Elimination System.

The Federal Water Pollution Control Amendments were passed in 1972. They provided the legislation for controlling the discharge from municipal and industrial waste sources. Permits granted under the National Pollutant Discharge Elimination System require secondary treatment by 1977. Standards are 30 mg/liter for 5 day biochemical oxygen demand (BOD(5)), 30 mg/liter for suspended solids, and 200 organisms/100 ml for coliform densities. These standards were tested for the three-cell, in a series lagoon system at Blue Springs, Missouri. The objectives of the tests were: to determine the performance of a three-cell, series operated, lagoon; to determine the relative performance of the three cells; and to determine the feasibility of slow sand filtration. Two sand filters were used for the tests, one with an effective sand size of 0.3 mm and the other, 0.22 mm. Laboratory analyses were conducted for biochemical oxygen demand, chemical oxygen demand, suspended solids, nitrogen, phosphorus, coliforms and various metals. During the winter, 84% of the BOD(5) removal occurred in Cell 1 and none in cells 2 or 3. Cells 2 and 3 reduced COD and suspended solids by 32% and 23%, respectively. The fecal coliform count was reduced from 475,000 to 22,000 organisms/100 ml. In the spring, BOD(5) removal was 88%. BOD(5) and suspended solids concentrations both met the secondary treatment criteria, while the coliforms were in excess of the limit. Data for the summer were in the process of being generated. (See also W76-05319) (Pinto-FIRL)
W76-05323

COST-EFFECTIVENESS ANALYSIS FOR WATER POLLUTION CONTROL,
National Environmental Research Center, Cincinnati, Ohio.
R. Smith.
In: Upgrading Wastewater Stabilization Ponds to Meet New Discharge Standards, August 21-23, 1974, Logan, Utah, Utah State University, p 199-226. 20 fig, 20 ref, 2 append.

Descriptors: *Cost analysis, *Economics, *Water pollution control, *Analysis, Design, Treatment, Waste water treatment, Mathematical studies, Cost comparisons, Planning.
Identifiers: Cost-effectiveness analysis.

Over the last ten years, the Environmental Protection Agency has shifted its emphasis from the purely scientific aspects of pollution control to the study of design and cost-effectiveness. The concept of cost-effectiveness is very closely related to that of best practicable treatment which was set up as a goal to be reached in 1983. The concept of cost-effectiveness is discussed. All feasible alternatives to achieving the required level of treatment should be evaluated and cost analyzed. Other considerations besides cost may include: expected residential and industrial growth; infiltration and inflow impact on the treatment facilities; reusing treated waste water in industry or agriculture; least costly treatment process; factors such as sludge retention time, hydraulic detention time, water temperature and final settler overflow rate; the impact on improved methods of operation and maintenance on effluent quality; and the integration of storm water facilities with dry water treatment facilities. Cost-effectiveness guidelines make no allowance for inflation in wages, power costs or capital cost. In order to make a cost comparison, stream of costs must be converted to one of three bases: present worth, or lump sum expenditure at the beginning of a planning period; future worth, at the end of a planning period; or continuous cash flow at a fixed rate. Conversion equations and diagrams are presented. Cost-effective analysis is applied to a proposed activated sludge plant for a municipal community. (See also W76-05319) (Pinto-FIRL)
W76-05324

WASTE WATER TREATMENT AT ZANUSSI.
Electroplating and Metal Finishing, Vol. 27, No. 11, p 35, 37, November, 1974.

Descriptors: *Waste water treatment, *Industrial wastes, *Metals, Heavy metals, Chemical precipitation, Sludge treatment, Europe, Hydrogen ion concentration, Salts, Treatment facilities.
Identifiers: pH control, Redox control, Metal finishing wastes, Chromium, *Italy.

The Zanussi Company, Pordenone, Italy, produces more than a million refrigerators, washing machines, cookers and other white goods each month with the accompaning problem of large volumes of waste water from the many different departments responsible for cleaning, preparing, and electroplating the tons of sheet metal used. The company is installing a waste water treatment plant capable of treating almost 400 cu m of water per hour. The treatment consists of four tanks: tank 1 performs pH and redox control through the addition of sulfuric acid and sodium bisulfate; tank 2 is the homogenization and stabilization tank; tank 3 displays measures and indications of pH value, performs fine adjustment of oxide reduction value, and is the optimization of the reduction phase; and, tank 4 is the homogenizing-capacity tank for emergency interventions. Sediment obtained after treatment will be filter pressed or centrifugally separated, dried, and then used for making ceramics, roof tiles, and other building materials. The purified water will be released to the sewer. The various stages of treatment are continuously monitored and reagents are added automatically. The system is capable of reducing the amoung of hexavalent chromium compounds to less than 0.1 ppm. Other heavy metal salts are also removed. (Orr-FIRL)
W76-05327

THE TREATMENT OF HIGH PROPORTIONS OF TEXTILE EFFLUENT IN ADMIXTURE WITH SEWAGE,
A. P. Jones.
Water Pollution Control, Vol. 73, No. 5, p 551-563, November, 1974. 3 fig, 9 tab.

Descriptors: *Waste water treatment, *Industrial wastes, Municipal wastes, Textiles, Biological treatment, Filters, Tertiary treatment, Sprinkler irrigation, Sludge treatment, Treatment facilities, Pulp wastes.
Identifiers: Biofilters, Combined municipal-industrial wastes.

The Borough of Glossop, U.K., treatment plant is in the process of being modified and enlarged to accommodate an increased domestic population and to provide for the treatment of the wastes from a textile finishing factory. The original plant was designed for a flow of 5230 cu m per day; the extensions will allow for a total of 15,200 cu m per day. Biological filters have been chosen as a main treatment system rather than activated sludge processes. Tertiary treatment is provided by Farrow spray irrigation equipment; twelve spray guns with a rate of application of 7300 cu m/ha day are used. New sludge treatment is provided for by the installation of two Johnson Progress automatic filter presses in conjunction with an in-line conditioning system. The previously used method of cold digestion followed by drying of the sludge is being discontinued. Further explained are the characteristics of the sewage and textile wastes; the sources of the textile wastes; the design parameters for the extension, including biological filters, secondary sludge production, and recovery of costs (the formulae employed are given); pretreatment of industrial wastes; and, the effects of the industrial wastes on the sewage works. (Orr-FIRL)
W76-05328

CATALYTIC REMOVAL OF SODIUM SULFIDE FROM AQUEOUS SOLUTIONS,
Ueno Environmental Science Research Lab., Nagoya (Japan).
Y. Ueno.
Journal Water Pollution Control Federation, Vol. 46, No. 12, p 2778-2784, December 1974. 7 fig, 5 ref.

Descriptors: *Waste water treatment, *Industrial wastes, Oil industry, Odor, Activated carbon, Sulfides, Sodium compounds, Pulp wastes.
Identifiers: Carbon black, Ferric sulfate, *Catalytic oxidation, *Sodium sulfide.

Wet scrubbing of foul gases, such as those released during the kraft pulping process by an aqueous sodium hydrate solution is a very effective method for capturing them. Complete oxidation of sodium sulfide can remove this odor source from kraft mills, ironworks, and cellophane, town gas, and petrochemical factories. This paper reports on the oxidation of sodium sulfide in an aqueous solution through the use of recoverable catalysts. The catalytic activity of activated carbon, carbon black, and a mixture of carbon black and ferric sulfate was determined. Two processes are involved in determining the overall rate of sulfide oxidation: the rate at which oxygen is absorbed by the solution; and, the rate at which oxygen reacts chemically. The optimum process occurs in the intermediate region where the overall oxidation rate is influenced by both the oxygen mass transfer rate and the chemical reaction rate. The carbon black and ferric sulfate mixture was found to be the most effective in catalysing the oxidation of sodium sulfide. Good results were obtained with the reuse of these catalysts whether recovered chemically or by centrifugation. (Orr-FIRL)
W76-05329

IMPROVING MERCURY (II) REMOVAL BY ACTIVATED CARBON,
Texas Univ. at Austin. Environmental Health Engineering Group.
M. J. Humenick, Jr., and J. L. Schnoor.
Journal of the Environmental Engineering Division Proceedings of ASCE, Vol. 100, No. EE6, * 1249-1262, December, 1974. 10 fig, 1 tab, 22 ref, 1 append.

Descriptors: *Waste water treatment, *Industrial wastes, *Mercury, Water pollution sources, Chemical wastes, *Activated carbon, Chelation, Chemical precipitation, Hydrogen ion concentration.

The principal sources of mercury pollution are mercury cell chloralkali manufacturers, chemical processors, and the agricultural and pulp and paper industries. The research project described concentrated on the investigation and evaluation of a new process concept that could augment the efficiency of activated carbon treatment of waste water. The following conclusions were drawn from the results of the study: Calgon Filtrasorb 300 activated carbon removed mercury from dilute mercuric chloride solutions at pH 10 and pH 4; carbon capacities increased seven-fold in isotherm tests and almost 14-fold in column tests at the lower pH; the water-soluble chelates APDC and TETA significantly increased the removal of mercury by activated carbon at pH 10; carbon disulfide greatly increased the removal of mercury by activated carbon at pH 10 when the carbon was soaked with CS2 and dried prior to adsorption; ammonium 1-pyrrolidine dithiocarbamate (APDC) precipitated mercuric ions at pH 10 and pH 4; mercury removal in both the isotherm tests and the column run was probably increased by filtration of the APDC-mercury precipitate; low effluent concentrations were achieved in column runs with APDC chelate at high pH; good mercury removal was attained in column tests with granular activated carbon at low pH; and, column mercury capacities increased from 0.30 mg Hg to 4.1 mg Hg removed per g carbon by adjusting the pH from 10 to 4. The removal of mercury (II) by activated carbon treatment was shown to be feasible. Carbon removals from alkaline waste may be enhanced by chelation of the mercury with APDC, treatment of the carbon with CS2, or by lowering the pH of the waste water. (Orr-FIRL)
W76-05330

AGRONIMIC EFFECTS OF THE LAND DISPOSAL OF WASTES FROM THE AGRICULTURAL AND FOOD INDUSTRIES (REPERCUSSIONS AGRONOMIQUES DES EPANDAGES D'EFFLUENTS DES INDUSTRIES AGRICOLES ET ALTIMENTAIRES,
Institut National de la Recherche A Agronomique, Versailles (France). Station Centrale d'Agronomie.
A. Morisot, and R. Gras.
Annales Agronmiques, Vol. 25, No. 2-3, p 234-266, 1974. 6 fig, 14 tab, 3 ref.

Descriptors: *Waste water treatment, *Industrial wastes, *Food processing industry, Waste water disposal, Environmental effects, Agronomy, Agriculture, Fertilization, Soil physical properties, Soil chemical properties.
Identifiers: Land application, *France.

The agronomic effects of the land disposal of wastes from the agricultural and food industries are discussed. The results of a survey, conducted in 1972, on 32 factories of the agricultural industry in France are presented. Particular attention was given to recording the evolution of the physical and chemical properties of the soils. This allowed cases of over-fertilization to be observed. Emphasis was also placed on the importance of interactions between the nature of the waste, the amount of waste applied, and the nature of the soil receiving it, in the evolution of the physical properties of the soil. The effects of these applications on the farms which receive them are also described. (Orr-FIRL)
W76-05331

POULTRY PROCESSOR USING VIBRATING SCREEN SEPARATORS TO CLEAN WASTE FLOW.
Food in Canada, Vol. 34, No. 12, p 31-32, December, 1974. 1 fig.

Descriptors: *Waste water treatment, *Industrial wastes, *Food processing industry, Solids removal, *Separation techniques, Canada, Waste treatment, Poultry.
Identifiers: *Poultry processing wastes.

Sherwood Farms, a Division of Robin Hood Multifoods, limited, has installed a highly efficient waste treatment system at their poultry processing plant in Dundas, Ontario. The plant generates about 100,000 gallons of waste water from the daily slaughtering of 18,000 broiler chickens. Greater than 200 gallons of wet solids, including fat, fine offal, and pin feathers, must be removed before the waste water can be treated. The solids removal problem was solved by installing a 60 inch diameter Kason Model K-60 Vibro-screen Separator. The unit is the final stage between a course 1/4 inch screen and the aerobic treatment tank of the effluent treatment plant. Blinding of the screen with fat and pin feathers is prevented by a Kason Kleen-Sweep flexible top side wiper instal led on the Kason Separator. The Kason Separator's motion is variable with simple adjustment to provide optimum screening performance for various effluent characteristics. (Orr-FIRL)
W76-05332

TREATMENT OF SUGAR REFINERY-GENERATED EFFLUENT BY THE PUMPING METHOD (DIE REINIGUNG VON ZUCHER-

FABRIKSABWASSER MIT HILFE DES UMPUMPVERFAHRENS),
Zuckerindustrie, Vol. 24, No. 10, p 536-541, October, 1974. 4 fig, 4 ref.

Descriptors: *Waste water treatment, *Industrial wastes, *Food processing industry, Pumps, Biochemical oxygen demand, Aeration, Dissolved oxygen, *Pumping.
Identifiers: *Sugar refinery wastes.

A simple, inexpensive method for the purification of waste waters generated in a sugar factory is presented. The waste water is purified subsequently in four ponds, having a surface area of 200,000 sq m with a mean depth of 2 meters. To achieve thorough purification and to avoid malodorous emissions due to anaerobic decay under oxygen deficient conditions, the waste water is pumped back from the fourth into the first pond by means of two worm pumps via a circulation gutter which provides for the oxygenation of the water. The worm pumps each have a discharge capacity of 500 liters/second. In this manner, it is possible to feed a sufficient amount of oxygen to the waste water and to facilitate the natural ventilation in the ponds. As a result, the BOD5 content has been reduced from an average of 1,800 g/liter to less than 25 mg/liter. (Takacs-FIRL)
W76-05333

KRAFT MILL EFFLUENT TREATMENT PROCESS,
F. A. Brothers.
Canadian Patent 957,087. Issued October 29, 1974. The Patent Office Record, Vol. 102, No. 44, p 75, October, 1974.

Descriptors: *Waste water treatment, *Industrial wastes, Pulp and paper industry, *Patents, Color, Biochemical oxygen demand, Chemical precipitation, Sea water, *Pulp wastes.

A continuous process has been patented for treating highly colored, high BOD kraft mill effluents to reduce the BOD and color. The raw effluent is mixed with sea water in a ratio between 5 and 20 to one, respectively. This mixture is decarbonated and then adjusted to pH 7 with lme. Lime is then added slightly in excess of the stoichiometric amount to precipitate the magnesium ion content of the sea water and to form a magnesium hydroxide precipitate which removes essentially all of the colored bodies in the effluent. The precipitate is dewatered and the liquid is discharged. The precipitate is subsequently calcined to remove organic color bodies and to produce an ash containing about 60% MgO and 40% CaO. The CaO is removed in a second sea water treatment to produce saleable 98% MgO. (Orr-FIRL)
W76-05334

THE PRESENT AND FUTURE OF ALKALINE PULPING,
MacMillan Bloedel Research Ltd., Vancouver (British Columbia).
H. E. Worster.
Pulp and Paper of Canada, Vol. 75, No. 10, p 45-50, October, 1974. 2 fig, 6 tab, 29 ref.

Descriptors: *Waste water treatment, *Industrial wastes, Pulp and paper industry, Biochemical oxygen demand, Color, Toxicity, *Pulp wastes.
Identifiers: *Alkaline kraft bleaching.

The present status of alkaline pulping and speculations on the future of this process are presented. The kraft mill of today has much greater capacity than that of earlier mills, is operated continuously, yields a higher quality product than other pulping methods, generates much of its own steam, recovers its chemicals with a high efficiency, and also yields valuable by-products such as turpentine and tall oil. However, significant disadvantages of kraft pulping include the high raw material requirements per ton of products, pollution of the atmosphere with reduced volatile sulfur compounds, the need to process its aqueous effluents for the reduction of such undesirable properties as BOD, color, and toxicity to fish, the very high investment cost per ton of products, and the difficulty in bleaching. The immediate future of the pulping industry should see increased use of modified kraft pulping processes such as polysulfide and H2S-kraft and non-sulfur processes such as soda-oxygen pulping; oxygen bleaching will be widely applied and integrated with the alkaline pulping liquor system to minimize water pollution; and, by-product recovery will become more widespread due to increasing demand for these products. The characteristics of an ideal chemical pulping process are discussed. (Orr-FIRL)
W76-05335

WASTEWATER RECYCLE FOR DYE HOUSES,
Illinois Water Treatment Co., Rockford.
D. J. Burke, and C. M. Burke.
American Dyestuff Reporter, Vol. 63, No. 10, p 60, 63, 65, October, 1974. 2 fig, 1 tab, 11 ref.

Descriptors: *Waste water treatment, *Industrial wastes, *Dyes, Textiles, Filtration, Ion exchange, Activated carbon, *Recycling, Water reuse, Color, Operating costs, Capital costs.

The very high BOD and COD dye plant effluent and the high degree of color necessitate some type of treatment for dye containing waste water. The particular type of waste treatment required for dye removal is a function of the class of dye and its chemical composition. The uses of filtration, activated carbon adsorption and ion exchange for treatment of dye plant effluents and water recycling are discussed. The particular system examined was designed for complete recycle of dye house effluent. The effluent is first collected in a baffled retention vessel to equalize the flow rate and contaminant loading. The equlalized effluent is then screened and pumped to a diatomaceous earth filter where suspended solids larger than one micron are removed. The effluent passes from the filter to continuous counterflow carbon adsorption units. Following carbon adsorption, the dye waste stream enters a two-bed ion exchange system. Color bodies are removed in the carbon units and salts are removed in the ion exchange units. This process is capable of recycling about 80% of the water used in typical dye house operations. The operating and capital co sts are such that this system pays for itself over a five to ten year period when compared with conventional treatment processes. Pilot plant evaluations are necessary to determine the efficiency and economics of the system for a particular dye house waste water. (Orr-FIRL)
W76-05336

ROTATING DISK LOOKS PROMISING FOR PLANT WASTES,
B. C. Research Ltd., Vancouver.
J. C. Mueller, and K. S. Bindra.
The Oil and Gas Journal, Vol. 73, No. 2, p 66-68, January, 1975. 4 fig, 2 tab, 4 ref.

Descriptors: *Waste water treatment, *Industrial wastes, *Oil industry, *Biological treatment, *Oil wastes.
Identifiers: *Rotating biological disk, Refinery wastes.

Petrochemical refiners are now investigating the ability of a rotating biological surface (RBS), also known as a rotating biological contractor, a rotating biological unit, or a rotating biodisk, to treat refinery effluents. The rotating surface has been shown to offer many advantages for the treatment of domestic and agricultural wastes including: short retention time; low power requirement; almost complete elimination of short-circuiting of the wastes; good sludge characteristics; excellent control of effluent quality; resistance to shock loads and upsets; no foaming problem; and, a minimal amount of required operator skill. A laboratory study is described which was conducted to assess the performance of an RBS system on petroleum refinery wastes. The RBS treatment was found to detoxify the refinery waste exceptionally well. The RBS system, on a laboratory scale, was capable of meeting British Columbia Provincial effluent standards for a local oil refinery effluent. The study concluded that the advantages offered by this system for the treatment of domestic and agricultural wastes are also true for the treatment of refinery wastes. (Orr-FIRL)
W76-05337

OZONIZATION AS A MEANS OF WASTE WATER PURIFICATION,
J. Trejtnar.
Czechoslavak Heavy Industry, Vol. 10, p 34-35, 1974. 2 fig.

Descriptors: *Waste water treatment, *Industrial wastes, *Metals, *Ozone, Water reuse, Oxidation, Laboratory tests, Pilot plants.
Identifiers: Cyanide, *Metal finishing wastes.

Metal surface finishing waste waters are discharged with quantities of toxic materials, including cyanide. One method to eliminate cyanide is ozonization. Research was done at the Water Conservancy Research Institute and at the Chemical Equipment Research Institute, both in Brno, Czechoslovakia. The technology tested under both laboratory and pilot plant conditions consisted of ozonization of waste water and the use of ozone for the oxidation of the substance to be neutralized as well as for other materials, including bivalent iron, manganous salts, hydrogen sulfide, or nitrates. The reaction of ozone with cyanides works in two steps: 2KCN + 203 = 2KCNO + 202. Then, 2KCNO + H20 + 303 = 2KHC03 + N2 + 302. For ozone oxidation into cyanates about 1.1 to 1.6 volumes of ozone for one volume of cyanides are required. The process of ozonization can be performed continuously, with the purified water recirculated as service water. (Kramer-FIRL)
W76-05339

SLUDGE DEHYDRATION DURING THE PURIFICATION OF CIRCULATING WATER IN FOUNDRIES AND OF RESIDUAL WASTE WATER IN FOUNDRIES (SCHLAMMENTWAESSERUNG BEI DER REINIGUNG VON GIESSEREIKREISLAUFWASSER UND GIESSEREI-RESTABWASSER),
B. Moergeli, and G. Lerch.
Giesserei-Praxis, No. 20, p 410-413, October, 1974. 6 fig, 5 tab.

Descriptors: *Waste water treatment, *Industrial wastes, *Metals, *Sludge treatment, *Dewatering, Centrifugation, Dehydration.
Identifiers: *Foundry sludge, Filter presses, *Sludge dehydration.

The efficiencies of five different methods in the dewatering of sand-containing sludges from a foundry were studied in comparative tests. The dry matter content of the sludge averaged 8 percent. A decanter centrifuge (Escher-Vyss system) required the lowest investment cost and was highly efficient, but it was subject to abrasion and delivered a sticky filter cake which caused problems during transportation and disposal. A more expensive chamber filter press proved to be highly reliable and efficient in the case of thin filter cakes. A double screen belt press (Andritz system) proved to be highly dependable in operation due to its simple design and also proved efficient, yielding a filter cake with dry matter contents ranging from 49 to 64 percent. The tower filter press (Prefiltec system) was not suitable for the dehydration of foundry sludge. Another variable-chamber filter press supplied a filter cake with low water content but had a poor specific output, and required preliminary concentration of the sludge. (Takacs-FIRL)

W76-05340

REMOVAL OF HEAVY METAL IMPURITIES FROM AQ EFFLUENTS.
Netherlands Patent NL 7404-782. Issued October 14, 1974. Derwent Netherlands Patents Report, Vol. No. 43, p D2, December 3, 1974.

Descriptors: *Waste water treatment, *Industrial wastes, *Patents, *Heavy metals, Tannery wastes, Magnetic studies, Iron.
Identifiers: Metal plating wastes, Magnetic separation, Ferromagnetic iron oxide.

A method for the removal of heavy metal impurities from aqueous solutions, such as effluent water from metal plating plants, glass industry, soda production and tanneries, has been patented. The waste water is treated with an alkali in an amount 0.9 to 1.2 times the equivalent of the anions of the heavy metal compounds. An oxidizing gas, preferably oxygen or air, is introduced at 60 C. The precipitated hydroxide is then converted into the ferromagnetic Fe304 and/or Fe0(OH), which are then magnetically removed from the water together with other metals occupying the places of the iron atoms in the ferromagnetic compounds. FeS04 in water can be added to ensure that iron is present in an excess of greater than twice the equivalent of other metals. Alternatively, finely comminuted metallic iron can be added and metal more noble than Fe would then be deposited on the iron particles and removed together by a magnetic field. (Orr-FIRL)
W76-05341

HYGIENIC ASSESSMENT OF CERTAIN SURFACE-ACTIVE SUBSTANCES-THE COMPONENTS OF EFFLUENTS FROM TEXTILE INDUSTRY ENTERPRISES (GIGIYENICHESKAYA OTSENKA NEKOTORYKH POVERKHNOST-NOAKTIVNYKH VESHCHESTV-KOMPNENTOV STOCHNYKH VOD PREDPRIYATIY TEKSTIL'NOY PROMYSHLENNOSTI),
For primary bibliographic entry see Field 5A.
W76-05342

OZONE-CARBON DYE-WASTE TREATMENT.
Textile Industries, Vol. 138, No. 10, p 43, 45, October, 1974. 1 fig, 2 tab.

Descriptors: *Waste water treatment, *Industrial wastes, *Dyes, *Ozone, Textiles, Activated carbon, Oxidation.
Identifiers: Synergistic effects.

Recently, waste dyeing water has been recognized as a source of environmental pollution and research has commenced on several new treatment techniques. One new technique is based on a combination of ozone and granular activated carbon. The use of oxidation by ozone and adsorption by granular activated carbon to treat waste water is well-documented. What is less well-known is the synergistic effect of these methods when combined. The combined use of ozone and activated carbon, as compared with the separate use of each, will often produce a doubled effect and result in low investment costs. The ozone/activated carbon process is free of disadvantages of sludge production that occur when conventional processes such as coagulative precipitation or activated sludge are used. The process basically involves decomposing and decoloring dyes in the waste water by ozone, while decomposing dissolved organic substances and then removing dirt by granular activated carbon. The carbon is periodically removed after use and regenerated at high temperature. The process has the following advantages: effective decoloration and removal of organic substances in addition to increased treatment power of the activated carbon; extremely high decoloration power of ozone; no foaming of treated water because of surface-active agents being decomposed; removal of noxious substances such as phenol; no sludge production; no particular location requirement for the installation; only a small area needed for the installation because of its compact size; simplicity in automatic operation and ease of maintenance; high performance and stability of the ozone generators; high adsorption power and regeneration efficiency; a synergistic effect from their combination; low operating costs; and, no secondary pollution. (Orr-FIRL)
W76-05343

A SWEDISH PROBLEM SOLVED,
W. Campbell.
Effluent and Water Treatment Journal, Vol. 14, No. 10, p 586-591, October, 1974. 1 fig, 1 tab.

Descriptors: *Waste water treatment, *Industrial wastes, *Foreign research, Municipal wastes, Tannery wastes, Pre-treatment(Water), *Biological treatment, Activated sludge, Europe, Water quality standards, Filtration.
Identifiers: Flocor, Flow equalization, Slaughterhouse wastes, Biofilters, *Sweden.

The new Kavlinge effluent treatment plant in southern Sweden illustrates the success that Sweden has had in combining industrial and municipal waste waters to meet her stringent standards of effluent quality. The treatment facility is designed to receive a volume of 6250 cu m/day and pollution load of 4700 kg BOD5/day. In addition to the municipal wastes, slaughterhouse/meat packing and tannery effluents are also treated. Preliminary treatment, including fat and grease separation and screening, is performed at the industrial sites but flow equalization occurs at the treatment facility. After pilot plant studies and examination of existing similar treatment plants, a two-stage biological system was recommended for both its economy and technical effectiveness. After flow balancing, the waste is treated over a single-stage biofilter systemcontaining 1230 cu m of Flocor. The effluent from the first stage then passes to an activated sludge system which operates on conventional loads and utilizes diffused air. During the first year of operatiOn (1973) an overall removal of 90% of the BOD was achieved. (Orr-FIRL)
W76-05344

INDUSTRIAL EFFLUENT PURIFICN.
German Patent DS 2360-491. Issued October 3, 1974. Derwent German Patents Abstracts, Vol. V., No. 41, p D2, November, 1974.

Descriptors: *Waste water treatment, *Industrial wastes, *Patents, Dyes, Chemical wastes, Heat treatment, Evaporation, Cyclones, Separation techniques.

A new method for purifying an industrial effluent, such as wash water from a dye works, has been patented. The effluent is heated to a temperature close to its boiling point at such a pressure that when evaporated in a tube evaporator to produce a volume increase of 1000:1, it will form steam that can be utilized in another part of the process. The resultant mixture of steam and foam from the evaporator is passed at high velocity into a separator, such as a cyclone. The energy of a purified steam is used in the process. The condensed steam is recycled as process water and the concentrate is burned. Where volatile impurities are present, the steam is passed through an adsorption and/or neutralization filter. (Orr-FIRL)
W76-05345

THE BIOLOGICAL TREATMENT OF FOOD INDUSTRY EFFLUENTS,
University Coll., Cardiff (Wales). Dept. of Microbiology.
C. F. Forster.
Institute of Food Science and Technology (U.K.), Vol. 7, No. 4, p 227-236, December, 1974. 4 fig, 2 tab, 30 ref.

Descriptors: *Waste water treatment, *Industrial wastes, *Food processing industry, Dairy industry, Poultry, *Biological treatment, Pre-treatment(Water).

A summary of the effluents produced by the food industry is presented which demonstrates the viability of treating these effluents by the normal bio-oxidation processes used in waste water treatment. Certain rules must be followed to ensure that optimum treatment occurs: adequate pretreatment must be performed; the flow must be balanced; the pH and nutrient levels must be adjusted; and, the system must not be overloaded. If these rules are followed then the only remaining problem is where to perform the treatment. Economics will determine whether the entire effluent will be discharged to the sewers, whether a partially treated effluent will be discharged to the sewers, or whether complete treatment will be done at the factory and the final effluent either reused or discharged to a natural watercourse. Case histories are presented which illustrate treatment methods for effluents from a dairy, a potato processing factory, and a distillery. (Orr-FIRL)
W76-05346

SALINE WATER CONVERSION ENGINEERING DATA BOOK - 1975.
Kellogg (M. W.) Co., Piscataway, N. J.
For primary bibliographic entry see Field 3A.
W76-05347

HOUSEHOLD WATER USE,
American Society of Civil Engineers, New York.
For primary bibliographic entry see Field 6D.
W76-05353

THE SEWERLESS SOCIETY,
H. H. Leich.
Bulletin of the Atomic Scientists, p. 38-44, November 1975. 22 ref.

Descriptors: *Human population, *Waste treatment, *Domestic wastes, Waste disposal, Sewage disposal, Equipment, Recycling, *Waste water treatment.
Identifiers: Human wastes, *Flush toilets, *Sewerless toilets.

Flush toilets waste about 40% of household water and contaminate water supplies. Present waste treatment systems risk transmitting diseases to water users downstream, waste large quantities of drinking water, require expenditures for sewer lines and treatment plants, accelerate eutrophication of water bodies, leak raw sewage, and build-up sewage sludge. It is suggested that sewage disposal systems be decentralized with wastes disposed of in individual dwellings. At least seven different types of sewerless toilets or sewage disposal systems are available or under development. Incinerating toilets are convenient but use large amounts of energy and sometimes create odors. Composting toilets do not require energy or water and produce compost free of pathogenic bacteria. Biological toilets turn wastes into water by enzymes and bacteria but require periodic additions of enzymes and bacteria and changes of charcoal filters. Oil flushed toilets separate wastes by gravity, incinerate wastes, and recycle the oil. Cannisters could hold wastes until transported to plants which could produce methane and fertilizer. Vacuum systems to remove wastes and aerobic tanks to digest wastes are also described. Non-polluting methods for human body waste disposal and generally applicable technology should be intensively investigated. (Buchanan-Davidson--Wisconsin)
W76-05439

LIQUID WASTE DISPOSAL SYSTEM,
Trane Thermal Co. Conshohocken, Pa.
Y-H. Kiang.
Chemical Engineering Progress, Vol. 72, No. 1, p 71-77, January, 1976.

Descriptors: *Waste water treatment, *Waste water disposal, *Industrial wastes, Liquid wastes, Incineration, Burning.

A liquid waste disposal system has been developed that will efficiently and economically dispose of organic, halogenated, metallic, and aqueous industrial wastes. The integrated system utilizes the heat and material available in each type of waste to lower the operational cost for disposal of other wastes. A typical integrated system comprises preconcentrator, burner, incinerator, quench chamber, heat exchanger, and gas treatment unit. The organic and halogenated wastes are used in the burner as auxiliary fuel. Metallic wastes are introduced downstream of the burner through the incinerator. The aqueous wastes are pre-concentrated and then injected into the combustion flame. Incinerator product gas is used as the preconcentration medium or else is cooled in the quench chamber. The effluent from the quench chamber is concentrated through the heat exchanger. The cooled gas from the heat exchanger is discharged to the atmosphere after final processing in the gas treatment unit. This basic integrated treatment system has been proven successful in a number of full-scale applications. Typical industrial wastes are converted into materials and energy which can be used inhoUse or commercialized for profit while the gases discharged meet air pollution regulations. (Orr-FIRL)
W76-05481

REUTILIZATION EXPERIMENTS ON WASTE WATER FROM PAPER AND PULP MILLS (KAMI PARUPU KOJO HISUI NO SAISEI RYO JIKKEN),
T. Ogasawara.
Kagaku Kojo, (Chemical Factory), Vol 19, No 10, p 60-61, 1975. 2 fig, 2 tab.

Descriptors: *Waste water treatment, *Industrial wastes, Pulp and paper industry, *Pulp wastes, Lignins, *Pilot plants, Activated sludge, Chemical precipitation, Activated carbon, *Water reuse, Recycling.

The operational results of a pilot plant for treatment of pulp and paper mill effluents are described. The flow of the treatment processes is pH adjustment, activated sludge, coagulation precipitation with calcium oxide, carbonation, sand filtration, and then activated carbon adsorption. The activated carbon treated water will be treated by electrodialysis or reverse osmosis in the future. The experimental results of the treatment processes following the coagulation precipitation stage are presented. After the pH of the influent to the carbonation process is adjusted, the water is aerated with a flue gas containing carbon dioxide to produce calcium carbonate. The calcium carbonate slurry is then recirculated within the carbonation bath to increase the calcium carbonate particle size which promotes better precipitation. Sand filtration with 0.6 mm diameter sand removes the SS which are not removed in the carbonation stage. The effluent from sand filtration contains less than 5 ppm SS. This effluent is passed into activated carbon adsorption towers after neutralization of the effluent. The COD values in the water before and after carbon treatment are 80-120 ppm and 30-50 ppm, respectively. The adsorption of COD by the activated carbon is lower than that generally observed in industrial or municipal waste water treatment, possibly due to the presence of high molecular weight compounds such as lignin in pulp waste water.(Katayama-FIRL)
W76-05482

THE STATUS OF WATER POLLUTION CONTROL IN THE SOVIET UNION, (FIRST PART),
Crown Zellerbach Corp., Camas, Wash. Environmental Services Div.
H. R. Amberg, I. Gellmand, and R. H. Scott.
Tappi, Vol 58, No 11, p 59-67, November, 1975. 5 fig, 4 tab.

Descriptors: *Waste water treatment, *Industrial wastes, Pulp and paper industry, *Foreign research, Pollution abatement, Treatment facilities, *Pulp wastes, Water quality standards.
Identifiers: *USSR(Eastern area)

Due to a cooperative working agreement between the United States and the Soviet Union, a technical delegation of four pulp and paper experts visited a number of Soviet pulp and paper mills as well as governmental agencies responsible for pulp and paper manufacture and related environmental problems in the U.S.S.R. The objectives of the visit were to determine the status of water pollution control in the Soviet Union and to see if any areas exist in which there would be benefits from cooperative programs between the two countries. This is the first half of a report on the visit which includes descriptions of the seven pulp and paper waste water treatment plants visited and also information and observations obtained from meetings with paper industry ministry personnel who control pulp and paper mill production and design and an agency which provides for the development and maintenance of water quality standards. This part covers the eastern part of the Soviet Union. (See also W76-05484) (Orr-FIRL)
W76-05483

THE STATUS OF WATER POLLUTION CONTROL IN THE SOVIET UNION, (SECOND PART),
Crown Zellerbach Corp., Camas, Wash. Environmental Services.
H. R. Amberg, I. Gellmand, and R. H. Scott.
Tappi, Vol. 58, No. 12, p 71-75, December, 1975. 1 fig.

Descriptors: *Waste water treatment, *Industrial wastes, Pulp and paper industry, Foreign research, Pollution abatement, Treatment facilities, *Pulp wastes, Water quality standards.
Identifiers: USSR(Western area).

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W76-05484

BIODEGRADATION OF COMPONENTS OF PULP WASTE EFFLUENTS BY BACTERIA, (2) ON THE DEGRADATION OF LIGNIN SULFONATES,
Nagoya Univ. (Japan). Faculty of Agriculture.
H. Kawakami, N. Mori, and T. Kanda.
Japanese TAPPI, Vol. 29, No. 11, p 36-41, November, 1975. 3 fig, 8 tab, 17 ref.

Descriptors: *Waste water treatment, *Industrial wastes, Pulp and paper industry, *Pulp wastes, Foreign research, Lignin, *Biodegradation, Bacteria, *Biological treatment.
Identifiers: *Lignin sulfonates.

A study was conducted on the biodegradation of the components of pulp waste by bacteria. Degradation of pine and beech lignin sulfonates by Pseudomonas ovalis was studied in stationary cultures for periods up to 60 days. Lignin sulfonates were slightly decomposed by this bacterium as compared with kraft lignin. The biodegraded lignin sulfonates included small amounts of nitrogen derived from protein and nucleic acid of the bacterial cells. Vanillin and syringaldehyde producing groups were decreased in the biodegraded lignin samples. p-Hydroxy benzonate and 4-methoxy isophthalic acid producing groups increased as the biodegradation of pine lignin sulfonate progressed. The results indicate that demethoxylation was occurring during the relatively long incubation period. Biodegradation of lignin sulfonates progresses in a manner similar to the degradation of kraft lignin. (Orr-FIRL)
W76-05485

OXIDATION UNIT CUTS DOWN ODOR FROM KRAFT PULP MILLS,
Groupement de la Cellulose, Saint-Gaudens (France).
A. Canonne.
Pulp and Paper International, Vol. 17, No. 13, p 50-51, 58, December, 1975. 3 fig, 1 tab.

Descriptors: *Waste water treatment, Pulp and paper industry, *Pulp wastes, *Odor, *Air pollution, Sulfite liquors, *Oxidation, Industrial wastes.
Identifiers: *Cellox process.

The new Cellox process for treatment of black liquors may be an answer to odor problems and air pollution problems in kraft pulp industry plants with direct-contact evaporators. The Cellox process permits almost total air oxidation of the sulfides immediately prior to their treatment in the direct-contact evaporator. By reducing the H2S content of combustion gases down to a few ppm, Cellox abates pollution. In the Cellox process, air is diffused through the concentrated liquor by means of porous, sintered steel candles in the oxidation reactor. The candles are connected with an air compressor through pipes. Air bubbles travelling through the liquor oxidize the sulfides and the gas is discharged into the atmosphere. Since the reactor operates on the countercurrent principle, flue gas emissions are completely odorless and contain no black liquor droplets. The oxidized, deaerated liquor is then pumped to the direct contact evaporator. The Cellox process can be used for oxidation treatment of concentrated black liquor as either a complete one-stage unit or a two-stage unit. It can also be employed as a complementary finishing step where mills are already equipped for oxidation treatment. (Loustau-FIRL)
W76-05486

SYSTEM ANALYSIS OF REFINER MILL OPERATION,
Idaho Univ., Moscow. Dept. of Chemical Engineering.
V. Venkatesh, S. R. Corson, and L. L. Edwards.
Tappi, Vol. 58, No 12, p 86-89, December, 1975. 7 fig, 1 tab, 5 ref.

To provide accurate data on fresh water requirements, white water consumption, and effluent flows, a computer system enabling mill operators to check existing mill operating conditions and to project future changes has been developed. The computer program consists of an executive program and a set of generalized subroutines representing each of the basic processing steps in a pulp and paper mill. It performs the balance calculations for all streams in the circuit in the sequence specified by the user. At the end of each iteration,

it tests to see whether the steady-state has been achieved. When convergence occurs, the results are printed. The system was used as an aid in evaluating various process alternatives in a groundwood newprint mill for reducing sewer loads. With the data provided, the computer examined four alternatives to the process and produced information on each alternative. Details of the mill process and the alternatives generated by the computer program are provided. The computer program was shown to develop reliable data for system alternatives and to aid in evaluating their effects on paper quality. (Loustau-FIRL)
W76-05487

TREATMENT AND SAFE DISPOSAL OF CATIONIC COATING COLORS,
Merck and Co., Inc., Pittsburgh, Pa.
R. H. Windhager.
Pulp and Paper Canada, Vol. 76, No. 12, p 45-47, December, 1975. 4 fig, 4 tab, 5 ref.

Descriptors: *Waste water treatment, Pulp and paper industry, *Color, Cations, *Neutralization, Polymers, Clays, *Pulp wastes, Industrial wastes.
Identifiers: *Cationic coating colors, Kaolin.

Hazardous cationic coating colors in paper mill effluents can be treated by simple processes in an effluent treatment system, resulting in neutralization and deactivation. A number of neutralization techniques were evaluated for effectiveness and economy. Synthetic anionic polymers were evaluated by the zeta potential technique. Polyacrylic acids and lignosulfonates were found to be effective flocculants for suspended cationic solids. Sodium hexametaphosphate (Calgon) was also effective. Several commercial kaolin clays were evaluated; a clay with phosphate concentrations has a significant neutralizing effect on cationic polymers. Calcium carbonate was also tested, but did not have a sufficient effect. Kraft black liquor was tested by a colorimetric test, and was found to be effective, however, compositions of liquors vary from mill to mill. It was estimated that of the neutralization techniquis tested, lignosulfonate would be the least expensive. All of the methods are relatively simple and would require minimum modification of existing treatment facilities. In addition, coated broke can be used without elaborate processing.(Loustau-FIRL)
W76-05488

SORPTION METHOD FOR THE PURIFICATION OF PETROLEUM CONTAINING WASTE WATERS (SORBTSIONNYE NETODY OCHISTKI NEFTESODERZHASHCHIKH STOCHNYKH VOD),
I. M. Garibov, A. A. Mamedov, and S. A. Efendieva.
Azerbaydzhanskiy Khimicheskiy Zhurnal, No. 3, p 75-76, 1975.

Descriptors: *Waste water treatment, Industrial wastes, *Phenols, *Adsorption, *Activated carbon, *Oils wastes, *Sorption, *Separation techniques, Water purification, Organic compounds.

The efficiency and suitability of different solid sorbents for the adsorption of petroleum in waste waters generated in extraction processes was studied. Activated carbon type AG-5 was found to have the highest sorption capacity of all other types of activated carbon. Its capacity was about twice as high for petroleum in waste water than for petroleum products. Aluminum and iron hydroxides showed negligible sorption capacity for petroleum. (Takacs-FIRL)
W76-05489

STUDIES OF A PURIFICATION MODEL FOR PHENOLIC WASTES BY ELECTROCHEMICAL METHOD (BADANIA MODELOWE OCZYSZCZENIA SCIEKOW FENOLOWYCH METODA ELEKTROCHEMICZNA),
A. Dabrowski, J. Mieluch, A. Sadkowski, J. Wild, and P. Zoltowski.
Przemysl Chemiczny, Vol. 54, No 11, p 653-655, November, 1975. 2 fig, 3 tab, 3 ref.

Descriptors: *Waste water treatment, *Industrial wastes, *Phenols, *Model studies, *Electrolysis, Electrodes, Flow rates, Electricity, Laboratory tests, Electrochemistry, Water purification, *Electrolytes.

A laboratory model for the purification of phenolic wastes with respect to quantity, flow output and power input under certain technical conditions is presented. Its chief component was an electrode-supplied electrolyzer with a two-chamber tank. The temperature of the electrolyte was maintained between 20 and 130 C by an oil thermostat. Phenol content in the waste water was determined by ultraviolet spectrophotometry while phenoxyacetate was measured by chromatography. The controlling parameters were temperature, flow density, tension, and flow rate. The model permitted the investigation of the effects of anodic current density, distance between electrodes, temperature, type of electrodes, flow rate, and circulation of the electrolyte on the oxidation rate of pollutants, especially phenolics, in waste water. The electrical efficiency of the process rapidly decreased to the extent that the phenol concentration decreased. If the entire phenol content with an initial concentration of 0.5 g/liter, with no other pollutants present, was oxidized, then the mea current consumption was 100 mg/A/hr and the mean voltage consumption was 30-40 mg/v/fr. The best effects were achieved for waste water with a pH of 8. The model is useful in projecting installations on an industrial scale. (Tallert-FIRL)
W76-05490

INTENSIFICATION OF THE BIOCHEMICAL PURIFICATION OF PHENOLIC WASTE WATERS IN AERATION TANKS (INTENSIFIKATSIYA BIOKHIMICHESKOY OCHISTKI FENOLSODERZHASHCHIKH STOCHNYKH VOD V AEROTENKAKH),
A. M. Asonov, S. V. Burkov, V. M. Kagasov, and A. A. Kern.
Koks i Khimiya, No. 9, p 41-43, 1975. 1 tab, 3 ref.

Descriptors: *Waste water treatment, *Industrial wastes, *Phenols, Biodegradation, Biological treatment, *Aeration, Treatment facilities.
Identifiers: *Aeration tanks.

An improved aeration tank, a biotank, developed to enhance the biological purification of phenolic waste waters in coking plants, is described. The biological purification process is intensified by increasing the activated sludge concentration in the tank without recirculation from the settling tank, which is achieved by the use of floating or anchored charge in the tank. The biomass is grown on the charge, which is preferably porous. While coke, coal, and certain plastic materials as floating charge proved to be useful, the oxidation capacity was highest when anchored charge was used. It was possible to increase the oxidation capacity and the productivity of the treatment plant by 2-3 times as compared with conventional aeration tanks. (Takacs-FIRL)
W76-05491

FINAL TREATMENT OF PETROLEUM CONTAINING WASTE WATERS IN HIGHSPEED FILTERS FOR PUMPING THEM INTO OIL-BEARING BEDS (DOOCHISTKA NEFT'SODERZHASHCHIKH STOCHNYKH VOD NA SVERKHSKOROSTNYKH FIL'TRAKH S TSEL'YU ZAKACHKI IKH V PRODUKTIVNYE PLASTY),
G. N. Nikiforov, and A. B. Adel'shin.
Neftepromyslovoe Delo, No. 9, p 31-34, 1975.

Descriptors: *Waste water treatment, *Filtration, *Oil wastes, Ultimate disposal, Separation techniques, Liquid wastes, *Filters, Organic compounds.
Identifiers: Stratal waters, *Sand filters.

Rapid sand filtration of stratal waters with high mineral and petroleum contents, generated in petroleum processing, was studied. A quartz sand layer of 2.64 m, composed of particles 2.5-5 mm in diameter, is recommended for preliminary filtration in two-stage filters for stratal waters containing up to 120 mg of suspended matter, up to 120 mg of petroleum, and up to 70 mg of total iron per liter. The filtration rate should be 50 m/hr in the preliminary stage, and 25 m/hr in the second filter. The removal efficiency was 85-90% for suspended matter, 64-85% for petroleum, and 85-100% for iron. For stratal waters with lower pollutant content, the grain size in the preliminary filter stage should be between 1.4 and 2.5 mm, and the rate of filtration in this stage should be 56 m/hr. Different coagulants, such as aluminum sulfate, iron chloride, calcium chloride, calcium hydroxide, aluminum hydroxide, and ammonium hydroxide, and ammonium hydroxide were tested; ammonium hydroxide was found to be the best coagulant. The recommended dose is 150 mg/liter on an ammonia basis. (Takacs-FIRL)
W76-05492

BIG SAVINGS WITH REVERSE OSMOSIS AND ACID COPPER,
J. Schrantz.
Industrial Finishing, Vol. 1, No. 12, p 30-32, 34, December, 1975. 6 fig.

Descriptors: *Waste water treatment, *Industrial wastes, Metals, *Reverse osmosis, Membrane processes, Recycling, Conservation, *Water reuse, Illinois, Industrial wastes.
Identifiers: *Metal finishing wastes, Zero discharge, Closed-loop systems, Acid copper.

Reverse osmosis (RO) treatment is saving materials and water at the Evanston, Illinois, plating plant of Federal Tool and Plastics Division of VCA Corporation. More than 8000 sq ft of plastic is electroplated daily at the plant. The RO treatment has reduced weekly copper consumption by one-third. In addition to returning concentrated materials to the plating bath, the closed-loop RO system reuses purified rinse waters. The RO unit is an automatic compact unit called an Osmonics Osmo-30043. It is composed of nine cellulose acetate membranes housed three each in three tubes. A stainless steel heat exchanger, fed with external cooling water at 65 F, maintains the operating temperature below 80 F. The concentrate from the RO treatment contains 40-48 ounces/gal of copper sulfate and acid salt. Dissolved solids in the concentrate total 10,000 ppm, in the second rinse, 1500 ppm, and in the permeate, 250 ppm. Several times a day the pumping pressure to the RO is valved to less than 300 psi to increase membrane flowthrough and thus lengthen the membrane life. (Loustau-FIRL)
W76-05493

DIFFERENTIAL-BED STUDY OF CYANIDE TREATMENT WITH ACTIVATED CARBON,
Case Western Reserve Univ., Cleveland, Ohio. Dept. of Chemical Engineering.
R. Prober, and W. E. Kidon.
Industrial and Engineering Chemistry, Process Design and Development, Vol. 15, No. 1, p 223-225, January, 1976. 2 fig, 1 tab, 7 ref.

Descriptors: *Waste water treatment, *Industrial wastes, Metals, *Activated carbon, Adsorption, Analytical techniques, Copper.
Identifiers: *Cyanide wastes, *Metal finishing wastes.

A differential-bed study was performed to provide data on activated carbon treatment of high cyanide

loadings such as those present in waste waters from electroplating shops, steel mills, and coke plants. Test solutions of reagent CuSO4 and N/CN in water were circulated through a packed carbon column with an upflow of 35 ml/min. Samples were withdrawn at 30 minute intervals and analyzed for total cyanides by a two-step procedure which consisted of direct analysis with a Cn-probe and indirect analysis by the method of known additions with a specific Af(+)/S2(2-) probe. Rate data and composite concentration curves are presented in a table and graph. The rate data confirmed earlier published data for activated carbon treatment of cyanides in the presence of copper dissolved oxygen that sorption rates were 40-70 micromolecules/g-hr for the optimum pH range of 6.5-8.0. Cyanide/copper molar ratios less than or equal to three result in precipitation outside the activated carbon bed. Rate data for oxygen and copper do not correlate with those for cyanides. Further data are needed to characterize formation of CNO- and elucidate the role of copper and dissolved oxygen in the mechanism, to determine the effects of temperature and particle size, and to consider long-term effects. (Loustau-FIRL)
W76-05494

NEW MEMBRANES FOR TREATMENT OF METAL FINISHING EFFLUENTS BY REVERSE OSMOSIS.
Plating and Surface Finishing, Vol. 63, No. 1, p 64, January, 1976. 3 fig.

Descriptors: *Waste water treatment, *Industrial wastes, Metals, *Reverse osmosis, Membrane processes, *Membranes, Hydrogen ion concentration.
Identifiers: Membrane life, *Metal finishing wastes.

Although reverse osmosis (RO) is a viable technique for the purification of metal finishing wastes, current membranes are reliable only within a pH range of 2.5 to 12. Cyanide bath rinse waters with a pH of 12-13 and acid copper bath rinse waters with a pH of 1-2 excessively shorten membrane life. The goal of AES Project 36 was to examine the practicality of a new membrane (NS-100) developed by the North Star Division of Midwest Research Institute. Long-term laboratory-scale RO tests were operated with acid copper and alkaline zinc cyanide baths using half-inch fiberglass RO tubes. Measurements were made of permeate flux, copper, acid, zinc, and cyanide rejections, total dissolved solids concentration, and organics rejection. The project demonstrated that the NS-100 membrane exhibits the chemical resistance and operating lifetime needed for practical application in metal finishing operations. However, the tubular NS-100 membrane has not yet been developed to a stage permitting on-site testing. (Orr-FIRL)
W76-05495

PROCESS FOR REMOVING HEAVY METALS FROM SOLUTIONS,
Stamicarbon B. V., Gellen (Netherlands). (Assignee).
J. H. Tooenheym, and B. H. N. Dassen.
United States Patent 3,931,002. Issued January 6, 1976. Official Gazette of the United States Patent Office, Vol. 942, No. 1, p 428, January 6, 1976.

Descriptors: *Waste water treatment, *Industrial wastes, *Patents, *Heavy metals, Separation techniques, *Solids contact processes, Mixtures, Liquid wastes.
Identifiers: *Keratin treatment, Gaseous mixtures.

A process for removing heavy metals from solutions and gaseous mixtures has been patented. The solutions or gaseous mixtures are contacted with a sulfur-containing reagent selected from the group consisting of reduced keratin, Bunte salts of keratin, and natural or synthetic polyamides at least part of whose amide groups has been replaced by thia-amide groups. The metals then become bound to the reagent. The Bunte salts of keratin are derived from keratin by treatment of the keratin in an aqueous medium with the aid of sulfite ions. The sulfite ions are derived from either alkali metal sulfites or alkaline earth metal sulfites. (Orr-FIRL)
W76-05496

LOOP CLOSED ON CADMIUM.
Products Finishing, Vol. 40, No. 6, p 50-53, March, 1976. 1 fig.

Descriptors: *Waste water treatment, *Industrial wastes, Metals, *Evaporation, *Recycling, Heavy metals, *Cadmium, New York, Water reuse.
Identifiers: *Metal finishing wastes, Cadmium plating.

The Dzus Fastener Company, West Island, NY, barrel plates its steel products with cadmium. A chemical-destruct system, installed in the 1950's, was incapable of meeting the stringent standards of the Suffolk County Department of Environmental Control. Installation of a 25 gph 'Wastesaver' evaporative recovery system has enabled the company to develop a closed-loop cadmium plating cycle. The evaporative recovery unit receives rinse water from the first of three counter-flowed rinse stages through an intermediate reservoir. It then evaporates the rinse water and returns distilled water directly to the rinse tanks. The concentrate is returned to the plating bath. Use of this system has eliminated chemical consumption from the previously used chemical-destruct system; eliminated losses of plating chemicals in the dragout; reduced water consumption; and, substantially lowered cartage costs for sludge removal. The evaporator is presently saving the company about $8000/year by the elimination of chemicals for chemical-destruction; it should pay for itself within two to three years. (Orr-FIRL)
W76-05497

EFFICIENT, NONPOLLUTING ETHYLBENZENE PROCESS,
Mobil Research and Development Corp., Paulsboro, N. J.
F. G. Dwyer, P. J. Lewis, and F. H. Schneider.
Chemical Engineering, Vol. 83, No. 1, p 90-91, January 5, 1976. 1 fig.

Descriptors: *Waste water treatment, *Industrial wastes, *Chemical wastes, *Recycling, Water reuse, *Catalysts, Chemical reactions.
Identifiers: *Ethylbenzene process.

An efficient, nonpolluting fixed-bed ethylbenzene process utilizing a solid, non-Friedel-Crafts catalyst to alkylate benzene with ethylene has been developed. After preheating and vaporization, fresh and recycled benzene combines with an alkylaromatics recycle stream and fresh ethylene. The mixture is fed to the alkylation reactor containing a solid catalyst, APEB. The reaction occurs at greater than 700 F, at 200-400 psi, and at high ethylene space-velocities. The aromatics-ethylene ratio is 5:20. Unreacted benzene from the reactor effluent is recycled to the alkylation reactor. Conversion of ethylene is essentially complete. The benzene-free product is then separated into an ethylbenzene final product and a heavier bottoms fraction. The latter is further separated into an alkyl-aromatics stream that recycles to the alkylation section and a residue that amounts to less than two weight percent on total feed and serves as fuel. Catalyst regeneration, necessary at most once every few weeks, uses nitrogen-air mixtures of controlled oxygen content to prevent an excessive temperature rise. The process was tested successfully in a 40 million lb per year plant in 1975 and is now ready for commercial use. The process avoids pollution problems, reduces catalyst consumption, eliminates the need for highly-corrosion-resistant construction materials, and recovers more easily the heat of reaction. (Loustau-FIRL)
W76-05498

SOLVENT RECOVERY FROM POLYMER PRODN. WASTES.
German Patent DS 1719-457. Issued October 9, 1975. Derwent German Patents Abstracts, Vol. W, No. 42, p A1, November 25, 1975.

Descriptors: *Waste water treatment, *Industrial wastes, *Patents, *Solvents, Polymers, Chemical wastes, Recycling, *Evaporation.
Identifiers: Evaporators, Solvent recovery.

A patent has been issued for a device to be utilized in recovering solvent from the wastes from production of polymers such as polyethylene or polypropylene. In such cases, the boiling point of the solvent at atmospheric pressure is below the melting point of the polymer. The device comprises a centrifugal thin-layer evaporator operating at or below atmospheric pressure, a compressing feed pump, and a heater operating under pressure. The wastes are pressurized before expanding into the evaporator. A rotor breaks up the solids into small particles. The device has high output per unit volume. (Orr-FIRL)
W76-05499

5E. Ultimate Disposal Of Wastes

FEASIBILITY OF REGIONAL UTILITIES FOR MANAGEMENT OF INDUSTRIAL AND MUNICIPAL WASTES,
Michigan Dept. of Commerce, Lansing. Office of Economic Expansion.
For primary bibliographic entry see Field 5G.
W76-05003

A SUPPLEMENTAL SOCIO-ENVIRONMENTAL DECISION TOOL: VALUE CONFLICTS ON LONG ISLAND,
Weston (Roy F.) Inc., Roslyn, N.Y.
For primary bibliographic entry see Field 5D.
W76-05049

UNSATURATED FLOW DURING SOIL TREATMENT OF SEPTIC TANK EFFLUENT,
Soil Survey Inst., Wageningen. (Netherlands)
For primary bibliographic entry see Field 5B.
W76-05058

WASTE MANAGEMENT SYSTEM,
H. D. Dick.
United States Patent 3,912,598. Issued October 14, 1975. Official Gazette of the United States Patent Office, Vol. 939, No. 2, p 924, October, 1975.

Descriptors: *Waste treatment, *Waste disposal, *Patents, *Burning, *Filtration, Condensation, Potable water, Catalysts, Equipment.

A patent has been granted for a waste management system. Equipment consists of a waste holding tank, a container for pressurized fuel-gas, and means for pressurizing the holding tank. A conduit is located between the waste holding tank and the container. A reaction chamber includes an outer shell, the interior of which is divided into upper and lower chambers. Within the lower chamber is a burner unit; within the upper chamber is at least one waste discharge nozzle, which is connected to the waste holding tank and discharges into the reaction chamber. Immediately above the nozzle are catalytic purifying means which contain material to be contacted by the vapor products. The fuel gas is ignited at the burner unit. Vaporization products of the reaction are condensed into liquid water and further purified by filtration. Conduits then direct the vaporization products to a potable water tank. (Kramer-FIRL)

W76-05063

SEWAGE AS A RESOURCE,
Wessex Water Authority, Bristol (England). Operations Directorate.
For primary bibliographic entry see Field 5D.
W76-05066

FEASIBILITY OF HYDRAULIC TRANSPORT OF GROUND HOUSEHOLD REFUSE THROUGH SEWER APPURTENANCES,
Foster-Miller Associates, Inc., Waltham, Mass.
For primary bibliographic entry see Field 5D.
W76-05070

PRETREATMENT AND ULTIMATE DISPOSAL OF WASTEWATER SOLIDS,
Environmental Protection Agency, New York. Region II.
For primary bibliographic entry see Field 5D.
W76-05079

STABILIZATION OF MUNICIPAL SEWAGE SLUDGE BY HIGH LIME DOSE,
Battelle Pacific Northwest Labs., Richland, Wash. Water and Waste Management Section.
For primary bibliographic entry see Field 5D.
W76-05081

SLUDGE INCINERATORS IN USE TODAY THAT MEET THE REQUIREMENTS OF STATE AND FEDERAL REGULATIONS,
R. L. Kaercher.
In: Research Symposium on Pretreatment and Ultimate Disposal of Wastewater Solids, May 21-22, 1974, New Brunswick, New Jersey, Rutgers University, p 237-244.

Descriptors: *Sludge, *Incineration, *Regulation, Clean Air Act, Legisltionl, United States, Federal government, Sludge disposal, Air pollution, Ultimate disposal, Odor, Cyclones, Opacity, Water vapor, Sludge treatment, Waste treatment.
Identifiers: On-site disposal, Particulate matter, Emission controls, Multiple hearth furnace, Flash drying, Wet oxidation, Fluidized bed, Bag filters, Electrostatic precipitators, Venturi scrubbers, Impingement bafflers, Sludge conditioning.

Sludge incinerators from the point of view of a construction supervisor are discussed. The problems confronting sludge disposal today are the conditioning of the sludge into a suitable form for incineration and the disposal and control of the ash and emissions. Federal regulations are stated in the Clean Air Act. Limits of particulate matter emissions are 0.031 grains per dry standard cubic foot with opacity less than 10% except for two minutes every hour. Water vapor is excluded from these limits. New Jersey regulations prohibit visible ash and limit particulate emissions to 0.1 grains per dry cubic foot. Six types of sludge incinerators are operative in the United States: multiple hearth furnace; flash drying; wet oxidation; fluidized bed; incinerating a mixture of sludge cake and solid refuse; and the spray drying of sludge with excess heat from an incinerator and burning the sludge in the incinerator. Emission controls are of two types: the dry type including cyclones, electrostatic precipitators and bag filters; and the wet type, including impingement bafflers and venturi scrubbers. Although no regulations exist concerning odor, it must also be controlled. It has been found that multiple hearth furnaces and wet scrubbers are the most practical methods for incineration and air pollution control. Dangers exist in the individual interpretation of Federal regulations. Some latitude must also be made for interpretation in different areas. (See also W76-05079) (Pinto-FIRL)
W76-05082

ECONOMIC CONSIDERATIONS FOR PLANNING SEWAGE SLUDGE DISPOSAL SYSTEMS,
Rutgers - The State Univ., New Brunswick, N.J. Dept. of Environmental Science.
D. A. Derr, V. Kasper Jr., M. Gould, and E. J. Genetelli.
In: Research Symposium on Pretreatment and Ultimate Disposal of Wastewater Solids, May 21-22, 1974, New Brunswick, New Jersey, Rutgers University, p 245-266. 7 fig, 3 tab, 3 ref.

Descriptors: *Economics, *Sewage sludge, *Sludge disposal, *Sludge, Planning, Disposal, Oceans, Storage, Dewatering, Transportation, Ultimate disposal, Landfill, Centrifugation, Cost analysis, Environmental effects, *Waste disposal.
Identifiers: Ocean disposal, Land disposal, On-site disposal, Volume reduction, Vacuum filters.

Procedures for the estimation and evaluation of costs for alternative sewage sludge disposal systems are suggested. Basic components or modes for sewage sludge disposal are identified. They are transport, dewatering, storage and site disposal. Land disposal can consist of dump truck, tank, truck, rail or pipeline. Water transport can be either by barge or pipeline outflow. Dewatering is considered for the purpose of volume reduction so that cheaper transportation may be used. Three methods in common use are sand beds, centrifuge and vacuum filters. Sewage sludge can be stored at the sewage plant or at a disposal site. Disposal methods include incineration, land disposal, landfill, and ocean disposal. The flow of activity of sludge consists of three modes: the origin, the transport, and the destination. Land disposal offers the greatest opportunity for recycle into the soil. Ocean disposal can cut dewatering costs but may require additional transportation. Costs of sludge disposal can be placed into three categories: capital investment, operating or variable costs, and fixed costs. To evaluate alternative methods of sludge disposal, in addition to investment and cost data, consideration must be given to budgetary constraints, environmental impact and risk associated with each alternative. Cost estimates from previous research provided the basis for the hypothesized solution presented. The least expensive solution would be for a sewage treatment plant located at barge docking facilities to barge sludge at 5% solids for less than 30 miles to be dumped into the ocean. The most expensive is land transport for over 17 miles and land disposal. (See also W76-05079) (Pinto-FIRL)
W76-05083

EPA'S POSITION ON OCEAN DISPOSAL IN THE NEW YORK BIGHT,
Environmental Protection Agency, New York. Region II.
R. T. Dewling, R. D. Spear, P. W. Anderson, and R. J. Braun.
In: Research Symposium on Pretreatment and Ultimate Disposal of Wastewater Solids, May 21-22, 1975, New Brunswick, New Jersey, Rutgers University, p 283-330. 12 fig, 13 tab, 1 append.

Descriptors: New York, *Municipal wastes, *Industrial wastes, *Sludge disposal, Coast Guard regulations, Regulations, Waste disposal, Chemical analysis, Federal Government, Ultimate disposal, Permits.
Identifiers: Maritime Protection Research and Sanctuaries Act, *New York Bight, *Ocean disposal, Industrial dumping, Municipal dumping, United States Coast Guard.

More than 70% of all municipal sludge and 60% of all industrial sludge is dumped in the area of the New York Bight. The Environmental Protection Agency became responsible for this area after the passage of the Maritime Protection, Research, and Sanctuaries Act in April, 1973, and since then significant changes have occurred. Eight industrial dumping applications/permits have been denied; forty seven dumpers were phased out and 12 additional were to be phased out by 1975; industrial waste and digestor cleanout must be dumped 106 miles offshore instead of 12 miles as before; and no new industrial or municipal dumpers have been approved since the Act was passed. A chemical and biological analysis of the wastes must be made by the dumpers and reported to the EPA; a vigorous enforcement program has been initiated with the help of the U. S. Coast Guard; and municipalities have been notified of the long range goal to completely phase out ocean dumping by 1981. (See also W76-05079) (Pinto-FIRL)
W76-05084

DISPOSAL OF SEWAGE SLUDGE TO SEA; UNITED KINGDOM EXPERIENCE AND PRACTICE,
Ministry of Agriculture, Fisheries and Food, Burnham-on-Crouch (England). Fisheries Lab.
J. E. Portmann.
In: Research Symposium on Pretreatment and Ultimate Disposal of Wastewater Solids, May 21-22, 1974, New Brunswick, New Jersey, Rutgers University, p 331-348. 2 fig, 3 tab, 18 ref.

Descriptors: *Disposal, *Sewage sludge, *Sludge disposal, Ultimate disposal, Oceans, Toxins, Organic matter, Legislation, Mathematical models, Pollutants, Marine animals, Marine fish, Sediments, Radioactivity techniques, Tracers, Recreation.
Identifiers: London(UK), Glasgow(UK), Manchester(UK), Oslo and London Dumping Conventions, Land disposal, *Ocean disposal, *United Kingdom.

The experience of the United Kingdom in sewage sludge disposal to the sea is discussed. This has been common practice for large cities such as London, Machester and Glasow for over 50 years. Twenty five percent of all sewage sludge is presently dumped to the sea either by tanker or by outfall pipes. As land disposal becomes more costly and dangerous to crops, this amount is expected to increase. In the past, dumping practices have been voluntarily controlled by the Ministry of Agriculture, Fisheries and Food (MAFF). New legislation will soon come into effect as a result of the recent Oslo and London Dumping Conventions. An application will have to be made and licenses must be granted before dumping is allowed. A number of factors are considered for the selection of a dumping site. These include: navigational and operational aspects of the dumping area; safeguarding the deposits of sand and gravel for the construction industry; interference with recreation; the effects on marine resources; and the effects of toxic materials. A procedure is outlined to protect marine resources from the effects of pollution. Mathematical models and radioactive tracers are used to measure the different current flows and the rates of settlement of the solids in the sludge are determined from sludge density and particle size. Effects of the sludge on sediments, animals and fish are monitored. So far the program has been successful and only minor problems have arisen. Extensive studies conducted on the London, Glasgow and Manchester dumping grounds have shown little or no accumulations of organic matter, little metal accumulation and little or no change in species composition. (See also W76-05079) (Pinto-FIRL)
W76-05085

EVALUATING THE IMPACT OF SLUDGE DISCHARGE TO SANTA MONICA BAY, CALIFORNIA,
California Univ., Berkeley; and Southern California Coastal Water Research Project, Berkeley.
For primary bibliographic entry see Field 5C.
W76-05088

A DISCUSSION OF A NEAR FIELD DISPERSION MODEL FOR SLUDGE DISCHARGES TO COASTAL WATERS,
Pacific Northwest Environmental Research Lab., Corvallis Oreg.
For primary bibliographic entry see Field 5B.
W76-05089

POLLUTION CONTROL AND SUGGESTED DISPOSAL GUIDELINES FOR CLINICAL CHEMISTRY LABORATORIES,
Edward J. Meyer Memorial Hospital, Buffalo, N. Y. Erie County Lab.
For primary bibliographic entry see Field 5G.
W76-05097

CORROSION IN DISPOSAL WELLS,
Subsurface Disposal Corp., Houston, Tex.
S. R. Owens.
Water and Sewage Works, Reference number, p R10-R12, April, 1975. 3 fig.

Descriptors: *Waste water treatment, *Industrial wastes, *Waste disposal, *Underground waste disposal, Injection wells, Waste disposal wells, Corrosion, Monitoring, Well screens, Well casings, Construction materials.

Industrial waste disposal wells are subject to corrosion problems such as stress-cracking, galvanic corrosion, and solvent action on elastomers. A typical disposal well contains a screen used to give uniform distribution of injection fluid. The screen is subject to stress-corrosion cracking, uniform corrosion, galvanic corrosion, and sinking. Excessive softening of the formation that supports the screen is another form of corrosion. Elastomers used in a packer must withstand the injection fluid and the injection zone liquid. They are subject to crevice and galvanic corrosion. Cement may fail if sulfur compounds are present, or if the effluent has a low pH. The tubing itself (carbon steel, stainless, or FRP) is subject to many forms of corrosion such as differential oxygen concentration cell corrosion, crevice corrosion in joints, and uniform corrosion due to acids. A corrosion test loop is recommended for most industrial waste disposal wells, where a by-pass would allow frequent evaluation of test materials. If there is a change in injection fluid, the downhole mixture should be tested as connate fluids can alter the injected matter. Caliper surveys, spinner logs, and temperature logs are ways of monitoring an injection well. (Murphy-FIRL)
W76-05125

HE USES VALUABLE RUNOFF.
Successful Farming, Vol. 73, No. 8, p. H10, June-July, 1975. 1 fig.

Descriptors: *Farm wastes, Waste disposal, Water reuse, *Agricultural runoff, *Drainage, *Feed lots, *Fertilizers, *Costs, Recycling.
Identifiers: *Waste collection, Land disposal.

Bob Atherton's Earlville, Illinois feedlot has undergone a number of low-cost alterations over the years in order to eliminate muck and runoff problems on his cement feedlot. The feedlot is 95 ft x 110 ft with a capacity of 350-375 head of cattle. The lot has an 8-10 in slope toward the middle. Liquids drain into a center outlet and buried tile and are carried to a 6 ft x 8 ft x 110 ft pit along the front of the lot. This pit collects nearly all the liquid runoff, including some loose manure. The pit is emptied about six times a year by means of a liquid spreader with a vacuum pump. A conventional loader handles the remaining solids. During winter months, Atherton tries to keep the pit about two-thirds full to prevent damage to the pit that might be caused by freezing and thawing if left empty. The system seems to work very well. A drier lot, drier bedding, and less labor have resulted in an economic savings over Atherton's original system. Final alterations for this lot cost $2,500, only about $7 per head capacity. (Cameron-East Central)
W76-05170

THE DRY DEEP PIT SYSTEM,
Purdue Univ., Lafayette, Ind.
For primary bibliographic entry see Field 5D.
W76-05172

ON THE HORNS OF THE DAIRY WASTE DILEMMA,
For primary bibliographic entry see Field 5D.
W76-05175

REGULATION ADOPTING EFFLUENT LIMITAIONS AND GUIDELINES FOR WASTEWATER DISCHARGES TO THE SURFACE WATERS OF NORTH CAROLINA.
North Carolina Dept. of Natural and Economic Resources, Raleigh. Div. of Environmental Management.
For primary bibliographic entry see Field 5G.
W76-05212

WASHINGTON WASTES DISCHARGE PERMITS.
Washington Pollution Control Commission, Olympia.
For primary bibliographic entry see Field 6E.
W76-05214

WYOMING ENVIRONMENTAL QUALITY ACT,
For primary bibliographic entry see Field 6E.
W76-05216

ALASKA WASTEWATER DISPOSAL REGULATIONS.
For primary bibliographic entry see Field 6E.
W76-05223

COMPARISON OF INORGANIC NITROGEN CONTENTS OF UNDISTURBED, CULTIVATED, AND BARNYARD SOIL PROFILES IN WISCONSIN,
Wisconsin Univ., Madison. Dept. of Soils.
For primary bibliographic entry see Field 5B.
W76-05263

TRANSPORT PHENOMENA APPLIED TO SLUDGE DEWATERING,
Dorr-Oliver, Inc., Stamford, Conn.
For primary bibliographic entry see Field 5D.
W76-05264

INDUSTRIAL OILS, RECOVERY OR DISPOSAL. (LES HUILLES INDUSTRIELLES, RECUPERATION OU ELIMINATION.),
For primary bibliographic entry see Field 5D.
W76-05280

EFFLUENT CONTROL IN ZINC BONDERIZING PROCESSES: I. THE RECYCLE OF RINSE WATERS VIA AN ION EXCHANGE PROCESS,
Puricons, Inc., Berwyn, Pa.
For primary bibliographic entry see Field 5D.
W76-05284

MANAGING INDUSTRIAL WASTE DISPOSAL,
Westinghouse Electric Corp., Pittsburgh, Pa.
For primary bibliographic entry see Field 5D.
W76-05310

COMPLETE WATEREUSE, INDUSTRY'S OPPORTUNITY.
American Inst. of Chemical Engineers, New York.
For primary bibliographic entry see Field 5D.
W76-05314

HANDLING OF SOLIDS AND LIQUID SIDESTREAMS RESULTING FROM WATEREUSE OPERATIONS,
Canys, Dresser and McKee, Inc., Boston, Mass.
For primary bibliographic entry see Field 5D.
W76-05317

SEPARATION OF ALGAE CELLS FROM WASTEWATER LAGOON EFFLUENTS BY SOIL MANTLE TREATMENT,
Utah State Univ., Logan. Div. of Environmental Engineering.
For primary bibliographic entry see Field 5D.
W76-05321

THE SEWERLESS SOCIETY,
For primary bibliographic entry see Field 5D.
W76-05439

LIQUID WASTE DISPOSAL SYSTEM,
Trane Thermal Co. Conshohocken, Pa.
For primary bibliographic entry see Field 5D.
W76-05481

TREATMENT AND SAFE DISPOSAL OF CATIONIC COATING COLORS,
Merck and Co., Inc., Pittsburgh, Pa.
For primary bibliographic entry see Field 5D.
W76-05488

FINAL TREATMENT OF PETROLEUM CONTAINING WASTE WATERS IN HIGHSPEED FILTERS FOR PUMPING THEM INTO OIL-BEARING BEDS (DOOCHISTKA NEFT'SODERZHASHCHIKH STOCHNYKH VOD NA SVERKHSKOROSTNYKH FIL'TRAKH S TSEL'YU ZAKACHKI IKH V PRODUKTIVNYE PLASTY),
For primary bibliographic entry see Field 5D.
W76-05492

5F. Water Treatment and Quality Alteration

METHYLENE PHOSPHONATES OF GLYCIDYL REACTED POLYALKYLENE POLYAMINES AND USE IN SCALE AND CHELATION,
Petrolite Corp., St. Louis, Mo. (Assignee).
P. M. Quinlan.
U.S. Patent No. 3,926,801, 8 p, 5 tab, 7 ref; Official Gazette of the United States Patent Office, Vol 941, No 3, p 1332, December 16, 1975.

Descriptors: *Patents, *Water treatment, *Scaling, Water quality, *Chelation, Corrosion, Damages, Descaling, Cations, Aqueous solution, Waste water treatment.
Identifiers: *Sequestering agents.

A process for inhibiting scale formation in aqueous systems by chelation or sequestration comprises adding to the system a methylene phosphonate of glycidyl compound reacted polyalkylene polyamine. The methylene phosphonate of glycidyl compound reacted polyalkylene polyamine has nitrogen-bonded methylene phosphonate units and nitrogen-bonded blycidyl compound reacted units. The chelating or sequestering agents thus described are of wide utility in sequestering or inhibiting precipitation of metal cations from aqueous solutions in the following applications: Soaps and detergents, textile processing, metal cleaning and scale removal, metal finishing and plating, rubber and plastics industry, pulp and paper industry, oilwell treatment and chelation in biological systems. (Sinha-OEIS)
W76-05030

METHOD FOR REMOVING BOTH ORGANIC MATTER AND BACTERIA FROM A BODY OF WATER,
Water Science, Inc., Calif. (Assignee).
J. Hedgpeth.
U.S. Patent No. 3,926,802, 4 p, 4 ref; Official Gazette of the United States Patent Office, Vol 941, No 3, p 1332, December 16, 1975.

Descriptors: *Patents, Water purification, Water quality control, *Water treatment, *Filtration, Chemical reactions, Oxidation, *Reduction(Chemial), Swimming pools, *Bacteria, *Organic matter, Iodides, Carbonates, *Waste water treatment.
Identifiers: Cuprous iodide.

A method and a mixture of complexes are described for treating bodies of water to remove bacteria and organic matter. A mixture of substantially water insoluble chemical complexes including cuprous iodide and copper carbonate are applied to a filter system, upstream of the filter mediam. The mixture coats the surfaces of the filter medium and accelerates the liberation of elemental iodine through the introduction of chlorine downstream of the filter. The result is, first, that an oxidation-reduction system is established by the presence of the complexes on the surface of the filter medium so that organic particles, bacteria and algae are oxidized and destroyed as the water passes through the filter medium. Secondly, collection of the organic matter, bacteria and algae on the surface of the filter medium is avoided and the water is decontaminated as it flows through the filter medium while the filter medium tends to remain in a free-flowing condition. (Sinha-OEIS)
W76-05031

DEVICE FOR THE CONTINUOUS TREATMENT OF LIQUID STREAMS,
Gesellschaft zur Wiederaufarbeitung von Kernbrennstoffen m.b.H., Leopoldshafen bei Karlsruhe (West Germany).
For primary bibliographic entry see Field 5D.
W76-05033

DEVICE FOR MEMBRANE FILTRATION,
Industriele Onderneming Wavin, N.V., Zwolle (Netherlands).
W. Jan de Putter.
U.S. Patent No. 3,926,813, 3 p 5 fig, 7 ref; Official Gazette of the United States Patent Office, Vol 941, No 3, p 1336, December 16, 1975.

Descriptors: *Patents, *Water purification, Waste water treatment, Water quality control, Membrane, *Membrane processes, *Filtration, Separation techniques.
Identifiers: *Membrane filtration.

A device for membrane filtration is comprised of an integral block provided with continuous holes. Walls of the continuous holes are liquid impermeable and resists the pressure applied during membrane filtration, and the length of the hole is chosen such that the liquid passed through the membranes flows toward the end of a block through an intermediate space between the membrane and the inner wall of the hole provided in this membrane. Several blocks are connected with each other by at least one hollow drawing bar, the inner side of the bar being connected in a liquid recovering space between two subsequent blocks. The liquid covering space is formed by placing the two blocks onto each other and accommodating a sealing ring between two blocks so that the blocks are held at a distance from each other. The intermediate space between the inner wall of a continuous hole and a membrane is comprised of a layer of porous material and/or grooves provided in the liquid permeable wall of a hole. The porous material is a non-woven synthetic resin material. (Sinha - OEIS)
W76-05037

READILY ATTACHABLE WATER FILTER WITH CUTOFF VALVE,
Aqua-Chem, Inc., Milwaukee, Wis. (assignee)
For primary bibliographic entry see Field 8C.
W76-05038

A GUIDE TO THE INTERSTATE CARRIER WATER SUPPLY CERTIFICATION PROGRAM.
Environmental Protection Agency, Washington, D. C. Div. of Water Supply.
For primary bibliographic entry see Field 5G.
W76-05040

EVALUATION OF WATER LABORATORIES, RECOMMENDED BY THE UNITED STATES PUBLIC HEALTH SERVICE.
Public Health Service, Washington, D.C. Bureau of State Services.
For primary bibliographic entry see Field 5G.
W76-05041

MANUAL OF INDIVIDUAL WATER SUPPLY SYSTEMS.
Environmental Protection Agency, Washington, D.C. Water Supply Div.
Report EPA-430/9-74-007, Revised 1974. 155 p, 28 fig, 8 tab, 40 ref, 4 append.

Descriptors: *Water supply, *Legislation, *Water quality standards, *Groundwater, Wells, Surface waters, Rural areas, Water treatment, Pumps, Construction materials, Hydrologic aspects, Water pollution control.

This manual is a revision of a 1962 publication and is concerned with the needs of individuals or institutions who must choose alternative water supplies. Information has been published for use by Federal agencies, State and local health departments, well drillers, contractors and individual homeowners. Recommended practices as defenses against contamination must be practical; costs must be consistent with benefits; and changes must make an important contribution to the useful life of the installation. This manual is divided into five sections: selection of a water source; groundwater; surface water for rural use; water treatment; and pumping, distribution, and storage. Appendices are also included which provide information on a recommended procedure for cement grouting of wells for sanitary protection, sampling for bacteriological quality, and for emergency disinfection. A suggestion for drafting a local ordinance to permit legal controls over nonpublic groundwater supply systems used for domestic purposes has also been prepared. (Kramer-FIRL)
W76-05042

A PILOT STUDY OF DRINKING WATER SYSTEMS AT BUREAU OF RECLAMATION DEVELOPMENTS.
Environmental Protection Agency, Washington, D.C. Water Supply Div.
Report EPA-430-9-73-004, June, 1973. 5 fig, 11 tab, 2 append.

Descriptors: *Potable water, *Reservoirs, *Water quality, Water pollution control, On-site investigations, Analytical techniques, Chemical analysis, Bacteria, Monitoring, Water quality standards, State jurisdiction, Potable water, Water supply, Coliforms, Water treatment, Pollutant identification.
Identifiers: Bacteriological analysis, Drinking water standards.

A pilot survey of 58 drinking water supply systems at 26 Bureau of Reclamation reservoirs assessed the water quality, construction, maintenance, operation, and surveillance of these systems. Field work was completed in October and November of 1971 and was divided between flood control and irrigation reservoirs in Kansas and California, and along the Colorado River. Bacteriological samples were collected of the distribution-system water, of the raw water, and at all hand-pumped wells. Complete chemical and physical analyses were made, and chlorine residuals were measured at each sampling point. In addition, the distribution system pressure was determined. Findings of the study indicated that 33 (57%) of the systems delivered water that failed to meet at least one constituent limit of the Drinking Water Standards. Fourteen systems (24%) did not meet at least one mandatory chemical or bacteriological limit and seven of the systems (12%) were contaminated with coliform bacteria. Only four (7%) of the systems practiced a bacteriological surveillance program that met the Public Health Service Drinking Water Standard criteria. To im rove the water quality it was recommended that State and county governmental agencies should initiate and maintain an acceptable program of bacteriological and chemical surveillance and provide regular sanitary surveys of the water system. An adequate surveillance program would cost about $200 per system. The Bureau of Reclamation should also maintain closer control of the water systems around their reservoirs. (Kramer-FIRL)
W76-05043

WATER WORKS PLANT STATISTICS.
Water and Pollution Control Directory, Vol. 113, No. 10, p 48-66, October, 1975. 11 tab.

Descriptors: *Treatment facilities, *Potable water, *Water treatment, *Water supply, *Municipal water, Water quality, Statistics, Costs, Design, *Canada, Waste water treatment.
Identifiers: *Water works plant statistics.

A comprehensive listing of Canada's municipal water works facilities is presented. The information was gathered from many municipalities and regulatory agencies, and serves as a national reference. Eleven tables are provided which detail the characteristics of each facility; these are arranged alphabetically by province. Included are: raw water characteristics (pH, total hardness, turbidity, and color); population served; actual population; source of water supply; ownership of system; type of treatment (aeration, chlorination, carbon, flocculation, filtration, fluoridation, iron removal, sedimentation, softening, sludge treatment, nutrient removal); plant design capacity; storage capacity; number of service connections, including domestic, industrial and commercial; costs per thousand gallons; and potable water supplied to other municipalities. (Kramer-FIRL)
W76-05055

CONTROLLING WATER POLLUTION,
World Health Organization, Geneva (Switzerland). Control of Environmental Pollution and Hazards.
For primary bibliographic entry see Field 5G.
W76-05061

WASTE MANAGEMENT SYSTEM,
For primary bibliographic entry see Field 5E.
W76-05063

A PILOT STUDY OF DRINKING WATER SYSTEMS IN THE NATIONAL PARK SERVICE,
Environmental Protection Agency, Washington, D. C. Office of Water Supply.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-240 494, $4.75 in paper copy, $2.25 in microfiche. Report EPA-520/9-74-016, December, 1974. 77 p, 7 fig, 9 tab, 4 append.

Descriptors: *Waste water treatment, *Water treatment, *Potable water, *Water quality control, *Water supply, Analytical techniques, Chemical analysis, Bacteria, Maintenance, Operation, Sampling costs, Pollutant identification, Legislation, Water quality standards, *National parks.

Identifiers: Bacteriological analysis, National Park Service.

A pilot study was conducted to assess the construction, water quality, operation, maintenance, and surveillance of water supplies on National Park Service Lands. Forty-two water systems in two geographical areas (Maryland, Pennsylvania and Virginia in the East and Arizona and California in the West) were chosen for field investigations. At each water system, samples were collected for bacteriological, chemical and physical analyses; distribution system pressure was determined; and chlorine residuals were measured. It was found that 48% (twenty systems) did not comply with at least one of the constituent limits of the 1962 United States Public Health Service Drinking Water Standards. Eleven systems failed to meet one or more mandatory limits, including fluoride, mercury, and lead. It was recommended that for these supplies, the presence of such metals should be continuously monitored and evaluated. Where bacteriological contamination was found, it was suggested that improved source protection and attention to the sanitary conditions is needed. Only about half the systems tested had an acceptable bacteriological surveillance program. Additionally, none of the chemical analyses performed at any facility included all of the constituents in the Drinking Water Standards. It was also found that, in general, these systems lacked adequate source protection, operation, and control. It was recommended that the National Park Service should place a higher priority on initiating and maintaining further bacteriological and chemical surveillance programs. Costs for adequate programming would be approximately $360 per system. (Kramer-FIRL)
W76-05090

CROSS-CONNECTION CONTROL MANUAL.
Environmental Protection Agency, Washington, D. C. Office of Water Supply.
For sale by the Superintendent of Documents, U. S. Government Printing Office, Washington, D. C. 20402. Report EPA-430/9-73-002, 1973. 57 p, 35 fig, 4 tab, 13 ref, 8 append.

Descriptors: *Plumbing, *Pipelines, *Sewerage, *Water distribution(Applied), Joints(Connections), Water conveyance, Hydraulic engineering, Potable water, Water pollution sources, Public health, Control, *Control systems, *Water quality control.
Identifiers: *Cross-connections.

A cross-connection is a link or channel which connects a source of pollution with a potable water supply. The polluting substance tends to enter the potable supply if the net force acting upon the liquid is in the direction of the potable supply. Cross-connections present a public health problem. Well-documented cases exist where cross-connections have been responsible for the contamination of drinking water and the spread of disease. Control of cross-connections is possible by the application of knowledge and vigilance. All municipalities witH public water supplies should have cross-connection control programs. This manual is designed as a guide for health officials, water works personnel, and plumbers to use in educational, administrative, and technical ways in conducting cross-connection control programs. Topics which are discussed include: public health significance of cross-connections; the theory of backflow and backsiphonage; methods and devices for backflow prevention; testing procedures for backflow preventers; administration of a cross-connection control program; and, cross-connection control ordinance provisions. (Orr-FIRL)
W76-05092

HISTORY AND DEVELOPMENT OF AWWA STANDARDS,
Alvord, Burdick and Howson, Chicago, Ill.
For primary bibliographic entry see Field 5G.
W76-05096

POLLUTION CONTROL AND SUGGESTED DISPOSAL GUIDELINES FOR CLINICAL CHEMISTRY LABORATORIES,
Edward J. Meyer Memorial Hospital, Buffalo, N. Y. Erie County Lab.
For primary bibliographic entry see Field 5G.
W76-05097

CHARACTERIZATION OF USAGE AND WASTEWATER IN ROADSIDE REST AREAS,
West Virginia Univ., Morgantown.
For primary bibliographic entry see Field 5D.
W76-05102

WYOMING PROTECTION OF PUBLIC WATER SUPPLY ACT,
For primary bibliographic entry see Field 6E.
W76-05217

HEALTH ASPECTS OF UNCOVERED RESERVOIRS,
Washington State Dept. of Social and Health Services, Olympia.
J. C. Pluntze.
American Water Works Association Journal, Vol. 67, No. 8, p. 432-437, August 1975. 6 p, 3 fig, 14 ref.

Descriptors: *Reservoirs, *Public health, *Water pollution sources, *Potable water, *Cost benefit theory, Chlorination, Water quality control, Water purification, Economics, Tangible benefits, Water quality standards, Standards, Water policy, Algae, Taste, Odor, Technology, Research and development, Economic feasibility.
Identifiers: Uncovered reservoirs, Vandalism, Potable water standards, Covered reservoirs.

Open reservoirs do not fit in with today's attitudes, standards, conditions, knowledge or technology. The view that health authorities should specify only the end point for water quality and not concern themselves with how it is achieved is in disfavor. Just because the water coming out of the tap meets the bacteriological and chemical parameters in the federal drinking-water standards does not necessarily mean that water supply systems are operating as they should. Several of the reasons presented for eliminating open reservoirs are: (1) post chlorination is not effective on many viruses; (2) seagulls and other disease carrying birds are common inhabitants of open reservoirs; (3) aquatic growths present potential taste, odor, and debris problems; and (4) acts of vandalism are easily perpetrated. Reservoirs can be covered to eliminate these problems but the cost is currently prohibitive. There is evidence, however, that the costs of covering reservoirs need not be unreasonable, though caution will have to be exercised to insure that roofs are watertight, perimeter drainage adequate, and screens and vents properly constructed so as to keep out birds, debris and algae. Otherwise, closed reservoirs will create more problems than they will solve. (Hoffman-Florida)
W76-05232

EVALUATION OF STATE DRINKING-WATER-QUALITY SURVEILLANCE PROGRAMS,
Environmental Protection Agency, Atlanta, Ga. Region IV.
For primary bibliographic entry see Field 5G.
W76-05233

WATER TREATMENT--TECHNIQUE FOR ENERGY CONSERVATION,
Betz Entec, Inc., Trevose, Pa.
L. B. Astbury, and P. J. Gaughn.
Plant Engineering, Vol. 29, No. 21, p. 139-141, 1975. 3 fig.

Descriptors: *Water treatment, *Energy loss, Air conditioning, Cooling water, Heat transfer, Scaling, Fouling, Corrosion control, Water softening, Demineralization, Boilers, Automatic control, Water conservation, Steam turbines, Efficiencies.
Identifiers: Blowdown.

Benefits resulting from process and air-conditioning cooling water treatment systems are discussed. Cooling water system heat transfer efficiency is adversely affected by scale, fouling, and corrosion. Scale can be controlled by softening, demineralization, and chemical treatment; inorganic fouling with dispersants; microbiological fouling with biocides; and ferrous metal corrosion by proper water characteristics, temperature, flow rate, and contact of metal with dissimilar metals. Treatments include threshold programs using polyphosphates which control corrosion, scale, and pitting. To further improve cooling water system operating efficiency and cut energy needs, dispersants are used to keep solids suspended in water and maintain maximum heat transfer and blowdown to control of dissolved and suspended solids. Relationships expressing normal water consumption in cooling systems show that water and chemicals are conserved if cooling water systems are operated at high concentration cycles; water saved will be proportional to size of the system. Automatic controls of variations in optimum pH and cycles of concentration save chemicals, water, energy, and labor. Plant steam turbine efficiency depends on quantity and temperature of heat received and rejected. Principles for cooling water systems also apply to industrial air-conditioning systems. Large installations offer more opportunities for energy savings. (Buchanan-Davidson--Wisconsin)
W76-05438

IMPACT OF THE SAFE DRINKING WATER ACT,
Environmental Protection Agency. Washington, D. C.
For primary bibliographic entry see Field 5G.
W76-05449

STATE REGULATORY AGENCIES AND THE SAFE DRINKING WATER ACT,
New Jersey Dept. of Environmental Protection, Trenton, N. J. Bureau of Potable Water.
For primary bibliographic entry see Field 5G.
W76-05450

THE RELATIONSHIP BETWEEN SUBSTRATE CONTENT, WATER QUALITY, ACTINOMYCETES, AND MUSTY ODORS IN THE BROAD RIVER BASIN,
Environmental Protection Agency, Athens, Ga. Surveillance and Analysis Div.
For primary bibliographic entry see Field 5C.
W76-05478

5G. Water Quality Control

FEASIBILITY OF REGIONAL UTILITIES FOR MANAGEMENT OF INDUSTRIAL AND MUNICIPAL WASTES,
Michigan Dept. of Commerce, Lansing. Office of Economic Expansion.
D. Poxson.
Available from the National Technical Information Service, Springfield, Va. 22161, as PB-250 452, $7.75 in paper copy, $2.25 in microfiche. Completion Report, December 1974. 207 p, append. OWRT C-2158(No.3374)(1).

Descriptors: *Water pollution control, *Pollution taxes(Charges), *Regional analysis, *Michigan, *Waste disposal, *Industrial wastes, *Municipal wastes, Organizations, Water laws, Public utilities, Legislation, *Regulation, Water management(Applied).

Identifiers: State authority, State agencies, Resource recovery Commission.

An effort was made to determine the feasibility of establishing regional organizations which, with state revenue bond backing, would provide waste disposal services to industries and municipalities for a fee. Interviews were conducted with industrial firm owners, managers, and technical operators and local government officials and waste plant operators in a selected region of Michigan to obtain their views on the proposed regional organization. Also, other states regional waste disposal laws were reviewed for use as possible models for a Michigan program. Recommendations included a proposal that a state authority an independent agency be formed, but should it be housed in an existing agency, it should be a non-regulatory one. Along with the study and resulting from information derived, legislation has been passed creating a resource recovery commission rather than an authority.
W76-05003

ROOKERY BAY LAND USE STUDIES, ENVIRONMENTAL PLANNING STRATEGIES FOR THE DEVELOPMENT OF A MANGROVE SHORELINE, STUDY NO. 3, ESTUARINE WATER QUALITY,
Conservation Foundation, Washington, D. C.
B. J. Yokel.
Available from the National Technical Information Service, Springfield, Va 22161, as PB-250 120 $5.00 in papper copy, $2.25 in microfiche. Partial completion Report, June 1975. 95 p 21 fig, 10 tab, 37 ref. OWRT C-4022(No. 9004)(7), C-1817(No. 3170(7), C-2201(No. 3385(7).

Descriptors: *Environmental effects, *Estuarine environment, *Florida, Temperature, Salinity, Estuaries, Dissolved oxygen, Turbidity, Phosphates, Bays, Sulfates, Fluorides, Chromium, Copper, Iron, Detergents, Color, Biological oxygen demand, Coliforms, Bacteria, Land use, Pesticides, Red tide, Hydrogen ion concentration, *Pollutant identification, *Water quality.
Identifiers: Naples(Fla), *Rookery Bay Sanctuary(Fla).

A study of water quality was conducted in and near the Rookery Bay Sanctuary, a mangrove estuary system south of Naples on the southwest coast of Florida in 1970-72. Observations were made on a series of physical, chemical and biological parameters, including temperature, salinity, dissolved oxygen, pH, turbidity, total ortho- and meta-phosphate sulfate, fluoride, chromium, copper, iron, detergents, true color, biological oxygen demand, coliform bacterial counts and pesticides. Data on precipitation, stream discharge and general geomorphological features of the area are also provided. The environmental effects of channelized discharge, a severe drought and an outbreak of red tide are discussed in relation to certain parameters.
W76-05005

ROOKERY BAY LAND USE STUDIES, ENVIRONMENTAL PLANNING STRATEGIES FOR THE DEVELOPMENT OF A MANGROVE SHORELINE, STUDY NO. 5, ESTUARINE BIOLOGY,
Conservation Foundation, Washington, D. C.
B. J. Yokel.
Available from the National Technical Information Service, Springfield, Va. 22161, as PB-250 121 $5.50 in paper copy, $2.25 in microfiche. Partial Completion Report, June 1975. 112 p, 23 fig, 18 tab, 64 ref. OWRT C-4022(No. 9004)(8), C-1817(No. 3170)(8), C-2201(No. 3385)(8).

Descriptors: *Benthos, *Crustaceans, *Mollusks, *Fish, Temperature, Salinity, Dissolved oxygen, Vegetation, Algae, *Florida, *Estuarine environment, *Environmental effects, Bays, Data collections, *Systematics, Regression analysis, Land use.
Identifiers: Rookery Bay Sanctuary(Fla), Naples(Fla), Seagrasses.

This study presents data on the distribution and relative abundance of animals from four major benthic habitat types in Rookery Bay Sanctuary near Naples, Fla. Quantitative monthly samples were taken during darkness using a 10-foot otter trawl over a period of 27 lunar months (June 1970-July 1972). A total of 328,239 animals were collected and identified representing over 200 species and 11 major taxa of animals. Catches were dominated by crustaceans, mollusks and fish which accounted for 96 percent of the total catch and 85 percent of the species. A species list is provided for the major taxa with monthly catch rates and observed ranges of temperature, salinity and dissolved oxygen for each species. Detailed statistical and biological analyses are provided for 14 species representing the dominant members of the major taxa. For the selected species a two-way analysis of variance was used to test the difference among habitats and the seasonal effect represented by months. A stepwise multivariate regression analysis was conducted for each of the selected species to evaluate the contribution made by dissolved oxygen concentration, salinity, temperature and vegetation weight in explaining the observed variation in catch rates. Results showed the vast majority of animals were found in habitats that contained segrasses and benthic algae. Conversely there were only small differences in the species counts between habitats. For the 14 species tested, vegetation weight accounted for a statistically significant part of the variation in 11 species, salinity was significant in 6, and temperature in 3.
W76-05006

ROOKERY BAY LAND USE STUDIES, ENVIRONMENTAL PLANNING STRATEGIES FOR THE DEVELOPMENT OF A MANGROVE SHORELINE, STUDY NO. 7, POLICY AND REGULATORY DIMENSIONS,
Conservation Foundation, Washington, D. C.
T. M. Alexander, and J. J. Bosley.
Available from the National Technical Information Service, Springfield, Va. 22161, as PB-250 122 $4.50 in paper copy,$2.25. in microfiche. Partial Completion Report, June 1975. 61 p, 40 ref. OWRT C-4022(No. 9004)(9), C-1817(No. 3170)(9), C-2201)(No.3385)(9).

Descriptors: Effects, *Regulation, *Land use, Administration, *Florida, *Planning, *Water policy Environmental, Coasts, Estuaries, Bays, *Land development.
Identifiers: *Rookery Bay(Fla), *Coastal management, *Coastal development.

Past and evolving coastal management policies and their application through planning and regulation in the Rookery Bay Area of Collier County, Florida, is the focus of this study. A case study of a major shoreline development proposal adjacent to the Rookery Bay Sanctuary is presented to highlight the key changes and conflicts in coastal management over the past few years. The major problems, issues and conclusions drawn from this local experience are then placed within the context of recent expansion and changes in Federal and Florida law and policy. Specific issues that must be addressed in order to deal more effectively with coastal developments in the future are set forth. These are followed by a discussion of the opportunities presented by passage of coastal zone management legislation in Florida and by the Congress. Recommendations are made to strengthen the application of the regulatory dimension locally in Collier County and in the broader framework of Florida and national policy.
W76-05007

ROOKERY BAY LAND USE STUDIES, ENVIRONMENTAL PLANNING STRATEGIES FOR THE DEVELOPMENT OF A MANGROVE SHORELINE, STUDY NO. 9, PRINCIPLES OF ECOSYSTEM MANAGEMENT,
Conservation Foundation, Washington, D.C.
J. Clark, and P. J. Sarokwash.
Available from the National Technical Information Service, Springfield, Va. 22161, as PB-250 123 in paper copy, $2.25 in microfiche. Partial Completion Report, June 1974, 17 p. OWRT C-4022(No. 9004)(10), C-1817(No. 3170)(10) C-2201(No. 3385(10).

Descriptors: Estuarine environment, *Ecosystems, *Land use, *Urbanization, *Decision making, *Estuaries, *Florida, Ecology, Conservation, Mangrove swamps, City planning, Coastal marshes, Wetlands, Flood plain zoning, Land classification, Watershed management.
Identifiers: *Coastal zone management, Coastal water, Environmental management, Residential growth, Collier County(Fla).

The protection of estuarine ecosystems requires a comprehensive coastal zone management program with specific environmental controls set within this larger framework. Control elements must be derived from characteristics of the ecosystem involved and designed to achieve the best level of ecosystem function possible. The basic management unit must be a complete coastal ecosystem including both the coastal water basin and related adjacent shorelands. Within this unit, components of vital importance to certain species or to the functioning of the entire ecosystem must be classified as vital areas and protected from significant alteration and pollution. Coastal floodplain may be designated an area of environmental concern or conservation area, protected by stringent controls on development, or designated a buffer area to protect vital areas along a shoreline. Specific management practices required to minimize disturbance of the coastal environment include controls on development activities which affect water circulation, temperature, salinity, turbidity, oxygen, nutrient supply, levels of toxic substances, and vital areas. Ecosystem requirements and recommended management practices applicable to south Florida are discussed, as are certain types of vital areas of south Florida, the ecological functions they perform, and their major vulnerabilities to disturbance.
W76-05008

ROOKERY BAY LAND USE STUDIES, ENVIRONMENTAL PLANNING STRATEGIES FOR THE DEVELOPMENT OF A MANGROVE SHORELINE, STUDY NO. 10, GROWTH AND LAND USE, STUDY NO. 11, ECONOMIC IMPLICATIONS OF LAND DEVELOPMENT ALTERNATIVES, STUDY NO. 12, A SIMULATION MODELING APPROACH TO THE STUDY OF DEVELOPMENT ALTERNATIVES,
R. A. Lemire, R. K. Davis, R. M. Hirsch, J. C. Zieman, and G. M. Hornberger.
Available from the National Technical Information Service, Springfield, Va 22161, as PB-250 124, $4.50 in paper copy, $2.25 in microfiche. Partial Completion Report, June 1975. 58 p, 5 fig, 5 tab, 19 ref. OWRT C-4022(No. 9004)(11), C-1817(No. 3170)(11), C-2201(No. 3385)(11).

Descriptors: *Florida, *Environmental effects, *Land use, Bays, Human population, Growth rates, *Land development, Economics, *Alternative planning, *Model studies, Ecosystems, *Estuarine environment.
Identifiers: *Rookery Bay(Fla), Collier County(Fla).

Study No. 10 attempts to link the population growth that poses a threat to Rookery Bay to the future economic, social and ecological stability of Collier County. A brief statistical survey was conducted; and a strategy for advocacy participation in the local planning and regulatory processes is recommended as the most effective way to deal with development threats to Rookery Bay. Study No. 11 sets up a number of prototype housing

developments appropriate to the Southwest Florida market and the location and topography of the study area. Each prototype is examined for its profitability and for its effects on Rookery Bay, estimated as the residential value of the land after all costs except environmental effects are estimated from total population, acreage of impervious surface and similar parameters. In Study No. 12 the simulation model was structured into four sub-models: (1) land use; (2) watershed and hydrology; (3) estuarine hydrodynamics, and (4) estuarine ecology. The relationship of these sub-models to one another is discussed.
W76-05009

FLOATING OIL FENCE,
J. M. Poche.
U.S. Patent No. 3,925,991, 5 p, 12 fig, 7 ref; Official Gazette of the United States Patent Office, Vol 941, No 3, p 1075, December 16, 1975.

Descriptors: *Patents, *Oil pollution, *Oil spills, *Water pollution control, Floating, Floats, Pontoons, Offshore platforms, Pollution abatement.
Identifiers: Floating fence, Oil tankers.

A rectangle of sealed flexible coupled interlocking pontoons make up a floating fence to confine and contain oil on a body of water in an area of almost any proportion. The coupled pontoons provide work space on and below the deck of the pontoons as well as space for skimming equipment and storage space for salvaged oil. The pontoons have an interlocking device that couples them in a manner that allows for lateral roll and horizontal movement. The fence may also be provided with an electromagnetic coupler to couple the oil fence to the side of an oil tanker or other vessel in order to form a rectangular containment around an oil spill. The fence may also be used around a fixed offshore structure such as a drilling platform. Operation of the interlocking structures is such that they require only a minimum of mechanisms and parts. The oil fence can be formed into any desired size to increase and/or to reduce the containment area by merely adding or removing one or more of the interlocking pontoons. (Sinha - OEIS)
W76-05020

FLOATAGE CONCENTRATING EQUIPMENT FOR NAUTICAL FLOATAGE RECOVERY APPARATUS,
J B F Scientific Corp., Burlington, Mass. (assignee).
R. W. Neal.
U.S. Patent No. 3,926,812, 5 p, 4 fig, 7 ref; Official Gazette of the United States Patent Office, Vol 941, No 3, p 1336, December 16, 1975.

Descriptors: *Patents, *Oil spills, *Oil pollution, *Water pollution treatment, Water pollution control, Water quality control, Flotsam, Jetsam, Skimming, Oil wastes, Ships, Equipment.
Identifiers: Booms, Sweeps.

A nautical vessel is equipped with an apparatus for concentrating and recovering floating material from the surface of a body of water particularly in heavy seas. Sweeps are deployed forward of a vessel in such a manner that they are continuously on the surface of the water. The deployment of each sweep from the vessel allows the sweep to move vertically, i.e. heave, and to rotate about a transverse horizontal axis, i.e. to pitch, along a path that carries the heel of the sweep into the bow opening without collision with the vessel. The doubly-articulated deployment of each sweep allows it to move freely about the two parallel axis of rotation but constrains the longitudinal axis of the sweep from movement other than along the normally vertical plane which passes through it. The result of these constrains is that the heel of each sweep enters the bow opening of the vessel when the sweep undergoes heavy sea motion. A barrier fixed to the vessel and in sliding engagement with the sweep during heavy sea motion maintains an essentially leak-proof sealing engagement with the sweep throughout this motion. Each sweep is deployed on a mounting boom hinged to the vessel. (Sinha-OEIS)
W76-05036

A GUIDE TO THE INTERSTATE CARRIER WATER SUPPLY CERTIFICATION PROGRAM.
Environmental Protection Agency, Washington, D. C. Div. of Water Supply.
Report EPA-520/9-74-024, June, 1975. 16 p, 1 fig, 1 tab.

Descriptors: *Water supply, *Potable water, Standards, *Water quality control, Legislation, Interstate, *Water quality standards, Water transfer, Transportation.
Identifiers: *Interstate carrier water supply certification.

The certification of water supplies for interstate carrier use is the responsibility of the Environmental Protection Agency, Regional Water Supply Division (ROW). Three safe-for-use certifications are necessary before water can be used on an interstate carrier: the watering point must be certified; the water supply must be certified; and, the bacteriological laboratory must be certified. This guide sets forth the criteria and procedures to be followed when classifying interstate carrier water supplies. It is an aid to the interpretation of the Drinking Water Standards designed to be used by persons responsible for ensuring potable water for interstate travelers. Bases for classification, a classification list, classification definitions, and classification criteria are discussed as well as water supply surveys and use prohibited notifications . Excerps from the Public Health Services Drinking Water Standards are presented. (Orr-FIRL)
W76-05040

EVALUATION OF WATER LABORATORIES, RECOMMENDED BY THE UNITED STATES PUBLIC HEALTH SERVICE.
Public Health Service, Washington, D.C. Bureau of State Services.
Public Health Service Publication No. 999-EE-1, 1972. 54 p, 2 append.

Descriptors: *Water analysis, *Laboratory tests, Analytical techniques, *Public health, Potable water, Pollutant identification, *Water quality standards.

A major part of the Public Health Service Drinking Water Standards deal with laboratory methods and the technical competency of laboratory personnel. Bacteriological results may be accepted from State Health Department laboratories, local government laboratories, water works authorities, and commercial laboratories if these laboratories are approved for use by the Reporting Agency and the Public Health Service. This publication gives performance standards for the evaluation of the bacteriological laboratory procedures and equipment as required by the 1962 Edition of the Public Health Service Drinking Water Standards and the 12th Edition of Standard Methods for the Examination of Water and Wastewater. A survey form is included which is the official public health service form to be used in evaluatinglaboratories. Guidelines to be followed when making an evaluation are presented. (Orr-FIRL)
W76-05041

MANUAL OF INDIVIDUAL WATER SUPPLY SYSTEMS.
Environmental Protection Agency, Washington, D.C. Water Supply Div.
For primary bibliographic entry see Field 5F.
W76-05042

PHOSPHORUS MOVEMENT IN SOILS: THEORETICAL ASPECTS,
Cleveland State Univ., Ohio. Dept. of Chemical Engineering.
For primary bibliographic entry see Field 5B.
W76-05048

A SUPPLEMENTAL SOCIO-ENVIRONMENTAL DECISION TOOL: VALUE CONFLICTS ON LONG ISLAND,
Weston (Roy F.) Inc., Roslyn, N.Y.
For primary bibliographic entry see Field 5D.
W76-05049

CONTROLLING WATER POLLUTION,
World Health Organization, Geneva (Switzerland). Control of Environmental Pollution and Hazards.
R. Helmer.
WHO Chronicle, Vol. 29, No. 11, p 428-434, 1975.

Descriptors: *Monitoring, *Water quality control, *Water quality standards, Water pollution control, Waste water(Pollution), Industrial wastes, Storm runoff, Environmental effects, Potable water, Public health.
Identifiers: World Health Organization.

The role of the World Health Organization (WHO) in all aspects of water pollution control is outlined. Sources of water pollution are described, including municipal, industrial and agricultural waste waters and urban runoff. Problems relating to water use, such as water supplies, recreational and agricultural uses, and water reuse are discussed. Water quality criteria and standards at an international level have been supported by the World Health Organization. A revision of the International Standards for Drinking-Water is being completed; guidelines detail minimal water quality requirements consistent with the health protection attainable in all member countries. WHO activities in water quality monitoring are also presented, involving the Global Environmental Monitoring System initiated by the United Nations Environment Programme (UNEP). (Kramer-FIRL)
W76-05061

USE OF ENVIRONMENTAL ANALYSES ON WASTEWATER FACILITIES BY LOCAL GOVERNMENT,
Teknekron, Inc., Washington, D.C. Applied Research Div.
For primary bibliographic entry see Field 5D.
W76-05072

CONTROL OF OIL AND OTHER HAZARDOUS MATERIALS,
Environmental Protection Agency, Cincinnati, Ohio. Office of Water Program Operations.
J. R. Hyland.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-238 096, $7.00 in paper copy, $2.25 in microfiche. Report EPA-430/1-74-005, June, 1974. 169 p.

Descriptors: *Legislation, *Regulations, *Oil spills, *Oil wastes, *Separation techniques, Waste treatment, Analytical techniques, Training, Personnel, Environmental effects, Water pollution control, Pollutant identification.
Identifiers: Training manuals, Oil pollution prevention.

A course manual has been prepared for employees of regulatory agencies who are responsible for responding to nonrecurring discharges of oil. Hazardous materials are defined; procedures for personal safety during spill cleanup operations are detailed. Characteristics of various types of oils are described, including chemical and physical analyses, the biological effects of such pollutants, and the microbiology of petroleum. Water pollution control techniques by dispersants, sinking

agents, burning agents, gelling agents, surface collecting agents, and sorbents are outlined. Oil water separator designs are also provided. Additionally, one chapter discusses the legislation affecting oil, national and regional contingency plans, and EPA oil pollution prevention regulation. (Kramer-FIRL)
W76-05073

AUDIOVISUAL INSTRUCTIONAL UNITS FOR WATER POLLUTION CONTROL TRAINING PROGRAMS,
Environmental Protection Agency, Cincinnati, Ohio. Office of Water Program Operations.
A. E. Donahue.
Available from the National Technical Information Service, Springfield, Va 22161, as PB-237 456, $3.75 in paper copy, $2.25 in microfiche. Report EPA-430/1-74-016, November, 1974. 34 p.

Descriptors: *Training, *Personnel, *Water pollution control, Activated sludge, Waste water treatment, Water treatment, Treatment facilities.
Identifiers: *Audiovisual instruction.

Audiovisual instructional units currently used for training personnel in water pollution control are catalogued in this document. These units were developed to be used with an instructor as training support and are not self-contained teaching devices. Titles and details on the subject matter of each tape/slide set are provided; subject areas include activated sludge processes, anaerobic digestion, various chemical procedures, chlorine treatment plants, safety in waste water works, basic statistics, and details on how to produce tape/slide presentations. Included in this catalogue is information on how to purchase or borrow the various instructional units. (Kramer-FIRL)
W76-05074

MUNICIPAL WASTEWATER TREATMENT WORKS CONSTRUCTION GRANTS, REFERENCES, REGULATIONS, GUIDANCE, PROCEDURES.
Environmental Protection Agency, Washington, D.C. Office of Water Program Operations.
For primary bibliographic entry see Field 5D.
W76-05075

EPA'S POSITION ON OCEAN DISPOSAL IN THE NEW YORK BIGHT,
Environmental Protection Agency, New York. Region II.
For primary bibliographic entry see Field 5E.
W76-05084

DISPOSAL OF SEWAGE SLUDGE TO SEA; UNITED KINGDOM EXPERIENCE AND PRACTICE,
Ministry of Agriculture, Fisheries and Food, Burnham-on-Crouch (England). Fisheries Lab.
For primary bibliographic entry see Field 5E.
W76-05085

HISTORY AND DEVELOPMENT OF AWWA STANDARDS,
Alvord, Burdick and Howson, Chicago, Ill.
W. H. Richardson.
American Water Works Association Journal, Vol. 67, No. 11, Part 1, p A33-A37, November, 1975. 1 fig, 4 tab.

Descriptors: *Waste water treatment, *Water treatment, *Standards, *Publications, Water pollution control, Construction, Pipes, Engineering, *Water quality standards, History.
Identifiers: *AWWA standards.

The standardization program of the American Water Works Association (AWWA), which has been ongoing for 100 years, includes standards as well as books, manuals, and handbooks developed by the organization. The definition of a standard is presented as, 'something established for use as a rule or basis of comparison in measuring or judging capacity, quantity, extent, value, or quality. The AWWA Standards Council has been responsible for the development of publications on standards; currently one book, five manuals and 69 existing standards are being reviewed and two new manuals and 28 new standards are being developed. A listing of present AWWA standards is providing, defining materials, substances, products, equipment, systems, procedures, and services as they relate to the water supply field. Proposed new standards on steel pipe, plastic pipe, swing check valves, and prestressed water tanks are also discussed. Additionally, the development of the 14th edition of Standard Methods for the Examination of Water and Wastewater is summarized. AWWA standards program offers benefits to the manufacturer, the engineer, and the consumer. (Kramer-FIRL)
W76-05096

POLLUTION CONTROL AND SUGGESTED DISPOSAL GUIDELINES FOR CLINICAL CHEMISTRY LABORATORIES,
Edward J. Meyer Memorial Hospital, Buffalo, N. Y. Erie County Lab.
D. A. Pragay.
Clinical Chemistry, Vol. 21, p 1839-1844, 1975. 7 tab, 6 ref.

Descriptors: *Waste water disposal, *Chemicals, *Laboratories, *Disposal, Hospitals, Liquid wastes, Waste disposal, New York, Water pollution, *Water pollution control, Public health.
Identifiers: *Clinical chemistry laboratories, Disposal guidelines, Buffalo(NY), Rochester(NY), Permissible levels.

Clinical chemistry laboratories may be discharging pollutants in considerable amounts. Surveys were conducted in hospitals in the Buffalo and Rochester, New York, metropolitan areas. Results showed that amounts of silver, arsenic, cyanide, chromium, copper, iron, mercury, zinc, acids, picrate and other organic solvents were being discharged. A stepwise procedure consisting of three phases was suggested on how to begin pollution control in clinical laboratories. The three phases were data collection, a short range remedial procedure and a long range remedial program. In the data collection phase four steps are required: a complete inventory of all liquid wastes of the laboratory should be made; an updated list of permissable levels of harmful pollutants should be obtained; the inventory of pollutants and the list of permissible levels should be cross-matched; and details of the laboratory sewer line must be determined. The short range remedial procedures consist of collecting the waste, disposing of the waste, obtaining a library of waste related reference material and cataloging and characterizing each waste according to its harmfulness and methods of disposal. The long range remedial program consists of devising methods that generate less pollutants, introducing new standards on hospital and equipment construction and safety, teaching ecology and safety consciousness to hospital personnel and offering and accepting the cooperation of other laboratories. Brief guidelines on waste disposal for different harmful wastes are given. (Pinto-FIRL)
W76-05097

POLLUTION CONTROL IN THE SWEDISH PULP AND PAPER INDUSTRY,
Swedish Pollution Control Co., Stockholm.
For primary bibliographic entry see Field 5D.
W76-05108

TREATMENT TECHNIQUE FOR HARMFUL SUBSTANCES IN WATER POLLUTION (SUISHITSU ODAKU KANKEI YUGAI BUSHITSU SHORI GIJUTSU),
For primary bibliographic entry see Field 5D.
W76-05123

MATHEMATICAL MODELS PREDICT CONCENTRATION-TIME PROFILES RESULTING FROM CHEMICAL SPILL IN A RIVER,
Dow Chemical U. S. A., Midland, Mich. Health and Environmental Research.
For primary bibliographic entry see Field 5B.
W76-05155

A LIVESTOCKMAN'S GUIDE TO POLLUTION LAWS,
R. Lutz.
Successful Farming, Vol. 70, p. 42-43, 50, October, 1972. 1 fig.

Descriptors: *Farm wastes, *Legal aspects, *Regulation, *Feed lots, Water pollution, Illinois, Indiana, Iowa, Kansas, Michigan, Minnesota, Missouri, Nebraska, North Dakota, Ohio, South Dakota, Wisconsin.

Laws are outlined for the states of Illinois, Indiana, Iowa, Kansas, Michigan, Minnesota, Missouri, Nebraska, North Dakota, Ohio, South Dakota, and Wisconsin. Addresses of Agencies charged with supervision of agricultural pollution in the 12 states are included. (East Central)
W76-05171

LEGAL IMPLICATIONS OF FEEDLOT POLLUTION IN NEBRASKA,
Nebraska Univ., Lincoln. Coll. of Agriculture and Home Economics.
D. C. Nelson.
Publication SB 529, Agricultural Experiment Station, University of Nebraska, Lincoln, 24 p. (n.d.).

Descriptors: *Farm wastes, *Legal aspects, *Feed lots, *Nebraska, Nuisance, Negligence, Trespass, Common law, Odor, Dust, *Water pollution control, Pollution abatement.
Identifiers: Noise, Pests.

The common law and statutory legal implications of feedlot pollution in Nebraska are examined. The fundamental inquiry in Nebraska is to determine whether the feedlot operation violates the accepted rule of decency and substantially depreciates the value of the nearby property. The judicial precedents of such inquiry are discussed in terms of odor, dust, noise, water contamination and pests. The common law theories of nuisance, negligence and trespass are examined. Statutory measures are also discussed and suggestions are made for ways to reduce the chances of legal suits against feedlots due to pollution. (Penrod-East Central)
W76-05173

THE EFFECTS OF A MARSH ON WATER QUALITY,
Hope Coll., Holland, Mich. Dept. of Biology.
E. D. Greij.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-250 498, $4.00 in paper copy, $2.25 in microfiche. Completion Report, Institute of Water Research, Michigan State University, E. Lansing, February, 1976. 24 p, 7 fig, 11 tab, 4 ref. OWRT A-077-MICH(1). 14-31-0001-5022.

Descriptors: *Water quality, Vegetation, *Nutrients, Cattails, *Marshes, *Emerging vegetation stage, *Michigan, Eutrophication, Lakes.
Identifiers: *Black River(Mich), Ottawa County(Mich), Holland(Mich), *Cattail marsh, Duckweed growth, Eutrophic lakes.

The primary purpose was to determine the effects of a cattail marsh on water quality. The use of emergent vegetation to improve water quality has been reported by several workers and was suggested by preliminary work on this marsh. The

study area was a cattail marsh located where the Black (Macatawa) River meets Lake Macatawa in Ottawa County at Holland, Michigan. The marsh was very dense as recently as 1971, but has continued to become more open until 1974-1975 when it was essentially a eutrophic lake. Several aspects of the study are discussed: (1) changes in nutrient levels above and below the marsh, (2) changes in nutrient levels within selected stands of cattail, (3) changes in nutrient levels in cattail enclosures, (4) marking cattail to determine export loss, (5) water levels and cattail distribution, (6) separation of cattail mat from underlying substrate, and (7) duckweed growth.
W76-05182

POLLUTION -- SHIPOWNERS' LIABILITY NOT LIMITED BY LIMITATION OF LIABILITY ACT. THE OCEAN EAGLE, 1974 AMC 1629 (DPR 1974) (DICTUM),
J. D. Kimball.
Journal of Maritime Law and Commerce, Vol. 6, No. 4, p. 661-64 (1975), 4 p.

Descriptors: *Ships, *Water pollution sources, *Costs, *Navigation, *Oil pollution, Oil spills, Judicial decisions, Transportation, Water, Water law, Legal aspects, Water pollution, Oceans, Bodies of water, Pollution, Puerto Rico, Damages, Panama Canal.
Identifiers: *Limitation of Liability Act, Wreck Act, Refuse Act, Oil Pollution Act.

The precise limit of shipowners7 liability for pollution damage has remained uncertain since the Supreme Court's decision in Askew v. American Waterways Operators. In the opinion of some commentators, that decision supports the view that a shipowner's liability to a state or private citizen will be limited in accordance with the Limitation of Liability Act (the Act), regardless of the fact that liability is based on a valid state statute. Although there has been no definitive ruling on the question, federal courts have repeatedly voiced dissatisfaction with the Act. In In re Chinese Maritime Trust, Ltd., the court held that the costs incurred by the Panama Canal Company, an agent of the United States, in removing a wrecked ship from the Panama Canal were not subject to the Act. The question of whether the Company's additional claim under the Oil Pollution Act was subject to the Limitation of Liability Act was not presented to the court, and thus remained unanswered. In a recent decision, The Ocean Eagle, the court stated in dictum that the Act would not limit liability where the polluting vessel had violated the Wreck Act, the Refuse Act, and the Oil Pollution Act. (Schilling-Florida)
W76-05184

PROTECTING PUBLIC HEALTH FROM HAZARDOUS SUBSTANCES: FEDERAL REGULATION OF ENVIRONMENTAL CONTAMINANTS,
Environmental Law Inst. Washington, D.C.
For primary bibliographic entry see Field 6G.
W76-05185

COMPELLED SELF-DISCLOSURE AND CIVIL PENALTIES: THE LIMITS OF CORPORATE IMMUNITY IN OIL SPILL CASES,
D. F. Dietz.
Boston University Law Review, Vol 55, No. 1, p. 112-133 (1975), 22p.

Descriptors: *Oil spills, *Judicial decisions, *Water Quality Act, *Rivers and Harbors Act, *Water pollution control, Supervisory control(Power), Federal government, Administration, Regulation, Jurisdiction, Decision making, Water pollution sources, Oil, Oily water, Navigation, Navigable waters, Coast Guard regulations, Legal aspects, Water law.
Identifiers: Corporate polluters, *Water Quality Improvement Act of 1970, Civil penalties, Fines, United States v LeBeouf Brothers Towing Co, United States v Mobil Oil Corporation, Refuse Act.

In recent years, Congress has increasingly employed civil penalties in the enforcement of regulatory legislation, because, unlike criminal sanctions, they can be imposed by administrative agencies without the constitutional protections afforded defendants in criminal prosecutions. However, in United States v. LeBeouf Brothers Towing Co., the civil penalty provision of the Water Quality Improvement Act was found to be criminal in nature, and the defendant, who had reported an oil spill from one of its ships as required by the Act, was declared entitled to statutory immunity under the Fifth, Sixth, and Fourteenth Amendments. If LeBeouf is upheld, it may undermine the operation of the 1970 Act by allowing those responsible for oil spills to escape liability as long as they report them. Another key question, considered in United States v. Mobil Oil Corp., is whether such immunity should be extended only to persons and not to corporations. The Court in Mobil decided that the penalty provisions of the Act did entitle corporations to invoke their constitutional rights. This decision has been much criticized, and it remains to be seen whether the appeals court in LeBeouf will follow it. (Parrish-Florida)
W76-05186

DEFICIENCIES IN THE REGULATORY SCHEME OF THE FEDERAL WATER POLLUTION CONTROL ACT AMENDMENTS OF 1972,
T. F. Linn.
St. Louis University Law Journal, Vol. 19, p. 208-222 (1974), 15 p.

Descriptors: *Federal Water Pollution Control Act, *Water pollution control, *Legal aspects, *Navigable waters, Regulation, Federal government, Legislation, Penalties(Legal), Federal jurisdiction, Judicial decisions, Commerce, Water law, Economics, Costs, Path of pollutants, Pollutants, Water pollution sources, Water pollution effects, Water pollution abatement, Water quality, Water quality control, Industries.
Identifiers: *FWPCA Amendments of 1972.

The scope of the Federal Water Pollution Control Act (FWPCA) is clearly restricted to the discharge of pollutants into 'navigable waters' while discharges into non-navigable waters escape most, if not all, of the Act's stringent water pollution control requirements. Individual decisions dating back to 1870 have determined that the term 'navigable waters' refers only to those bodies of water within the United States which are navigable for the purpose of commerce. All other waters are not protected by the FWPCA. Since costs of pollutant removal generally rise geometrically as increased removal is required, there may be an incentive for unscrupulous major polluters to relocate to areas where their discharges will not enter navigable waters, thus defeating the purpose of the Act. (Nursey-Florida)
W76-05187

ENVIRONMENTAL PROTECTION AND THE ROLE OF THE CIVIL MONEY PENALTY: SOME PRACTICAL AND LEGAL CONSIDERATIONS,
For primary bibliographic entry see Field 6G.
W76-05188

ENVIRONMENTAL PROTECTION IN CALIFORNIA: COURT ACTION POWERS OF STATE AND LOCAL GOVERNMENT ATTORNEYS,
For primary bibliographic entry see Field 6G.
W76-05189

ENVIRONMENTAL CLASS ACTIONS IN THE FEDERAL COURTS - PEERING THROUGH THE ZAHN SMOG,
For primary bibliographic entry see Field 6E.
W76-05190

COMMON LAW REMEDIES FOR SALT POLLUTION,
For primary bibliographic entry see Field 6E.
W76-05191

STATE REGULATION OF FEDERAL WATER APPROPRIATIONS: THE CALFORNIA EXPERIENCE,
California State Dept. of Justice, San Francisco.
For primary bibliographic entry see Field 6E.
W76-05192

MINING AND THE FEDERAL WATER POLLUTION CONTROL ACT AMENDMENTS OF 1972,
Amax, Inc., Denver, Colo. Law Dept.
P. Keppler.
Rocky Mountain Mineral Law Institute Annual, Vol. 20, p. 501-540 (1975), 40 p.

Descriptors: *Water quality control, *Federal Water Pollution Control Act, *Mining, *Mining industry, Agencies, Regulation, Permits, Erosion control, Federal government, State governments, Planning, Decision making, Water Quality Act, Erosion, Environmental control, Water, Water law, Legal aspects, Environmental effects.
Identifiers: Effluent limitations, Federal Water Pollution Control Act Amendments of 1972, Nonpoint source(Pollution), Groundwater pollution.

The 1972 amendments to the Federal Water Pollution Control Act totally restructure national water pollution control efforts. Previously, state water quality standards were the only federally imposed programs. The Amendments shift the emphasis from water quality standards to control of point source pollution. Two aspects have particular relevance to the mining industry. National Pollution Discharge Elimination System (NPDES) permits must be secured before final effluent limitation guidelines are established for a particular industry. The EPA has indicated that such permits will remain effective notwithstanding the subsequent issuance of more stringent guidelines. However, if the water quality of a receiving stream deteriorates below current applicable standards, a permit is subject to revocation or modification. A second problem is that an NPDES permit is required only for effluent discharges into navigable waters. Further, pollution from mining operations usually results from non-point sources. However, the EPA Administrator is charged with promulgating guidelines for identifying and controlling non-point source pollution. The report recommends that erosion and sedimentation control be incorporated in surface mining and reclamation programs. The 1972 Amendments represent an enormous challenge to the mining industry to develop methods for controlling and eliminating pollution from both point and non-point sources. (Jenkins-Florida)
W76-05193

THE COLORADO RIVER SALINITY PROBLEM WITH MEXICO,
H. Brownell, and S. D. Eaton.
American Journal of International Law, Vol. 69, No. 2, p. 255-271 (1975), 17 p.

Descriptors: Salinity, *Desalination plants, *Desalination processes, *Colorado River, *Mexican Water Treaty, *Mexico, Treaties, Water purification, Water treatment, Desalination apparatus, Drainage, Water quality, Saline water, Water supply, Water sources, Water demand, Arizona, Desalination wastes, International law, United States, Irrigation, Irrigation water, Irrigation efficiency, Water pollution sources.
Identifiers: *Imperial Dam(Calif).

Salinity levels in the Colorado River have been a continuous sore spot in U. S. relations with Mexico; with the history of the problem going back to the 1944 United States-Mexico Treaty for Utilization of Waters of the Colorado River. The principal area of disagreement has been the difference in quality between the water available to U. S. users below the Imperial Dam and the water delivered to Mexico at the northerly international boundary. Two events occurred in 1961 to bring the quality issue to the fore: the pumping of highly salin drainage from the Welton-Mohawk Irrigation and Drainage District of Arizona into the Colorado River; and the reduction of excess water received by Mexico due to intensified river use within the U. S. A task force formed to consider the quality problem, proposed three possible solutions: (1) elimination of the pollution source; (2) substitution of Imperial Dam quality water for the Welton-Mohawk drainage; and (3) desalinization of the Welton-Mohawk system. An analysis of these three proposals, as well as other issues raised by the salinity problem, is presented to show why the United States decided upon the construction of a desalination complex. (Hoffman-Florida)
W76-05194

ILLINOIS ENVIRONMENTAL LAW--THE NEW ASSAULT ON WATER POLLUTION,
Hackbert, Rooks, Pitts, Fullagar and Poust, Chicago, Ill.
M. D. Freeborn.
DePaul Law Review, Vol. 24, No. 2, p. 481-509 (1975), 29 p.

Descriptors: *Permits, *Navigable waters, *Pollution abatement, *Adoption of practices, *Illinois, Missouri River, Industries, Standards, Technology, Jurisdiction, Rivers and Harbors Act, Federal Water Pollution Control Act, Constitutional law, Federal government, State governments, Effluents, Administrative agencies, Regulations.
Identifiers: *Federal Water Pollution Control Act(FWPCA) Amendments of 1972, Refuse Act of 1899, Citizen suits, Enforcement, Industrial pollution, Environmental Protection Agency(EPA), National Pollution Discharge Elimination System (NPDES).

This article surveys the series of steps taken in Illinois to implement the Federal Water Pollution Control Act Amendments of 1972. The Amendments shift emphasis in the nation's water pollution control program from a system of water quality standards to a new system of effluent limitations, as well as mandating a permit system to be administered under the auspices of the Environmental Protection Agency (EPA). The author foresees various problems in the implementation of the Amendments' policies arising from (a) certain unclear language used in the Amendments themselves, (b) uncertainty as to when a permit is required, and (c) prolonged delays in the permit review process. If these problems are not speedily resolved, some states may again resort to using unsuited, but seemingly simpler, statutory devices such as the Rivers and Harbors Act of 1899. (Parrish-Florida)
W76-05198

COLORADO RIVER SALINITY PROBLEM: HAS A SOLUTION BEEN FOUND,
Denver Univ., Colo. Coll. of Law
For primary bibliographic entry see Field 6E.
W76-05200

THE ECONOMICS OF CLEAN WATER - 1973.
Environmental Protection Agency, Washington, D. C.
December 1973. 120 p, 5 fig, 68 tab.

Descriptors: *Federal Water Pollution Control Act, *Cost allocation, *Water pollution control, *Economics, *Economic prediction, Water pollution sources, Waste treatment, Cost benefit analysis, Economic justification, Municipal wastes, Industrial wastes, Industrial water, Phosphorous, Pollutants, Water pollution treatment, Tangible benefits, Nitrates, Water pollution sources, Industries, Oxygen demand.
Identifiers: Nonpoint pollution.

This report is the sixth of a series of reports sent to Congress as required by Section 516(b) of the Federal Water Pollution Control Act (FWPCA). It deals with a wide variety of topics, including: (1) nature of and trends in water pollutants; (2) municipal costs; (3) industrial costs; (4) nonpoint pollution; (5) benefits from water quality enhancement; and (6) economic constraints on pollution programs. Highlights of the report indicate that bacteria and oxygen consuming substances, the pollutants receiving the most widespread attention, showed general improvement over the last five years. However, phosphorous and nitrates, the primary pollutants contributing to eutrophication, increased over the last five years in many of the river basins tested. Surveys estimate that the cost of constructing the municipal treatment and collection facilities eligible for Federal funding under the 1972 FWPCA Amendments will be $60 billion (1973 dollars). Of this amount, $36 billion is needed for waste treatment plants and interceptor sewers, and $24 billion for correction of infiltration / inflow problems, new collectors, and combined sewer overflows. Industry will be required to invest about $12 billion in treatment facilities, not including thermal treatment plants, to meet the 1977 goals set for it. This, it is estimated will require private industry to invest approximately $3.5 billion annually. (Hoffman-Florida)
W76-05203

COAST GUARD MISCELLANEOUS-PART 2(CONVENTION ON HIGH SEAS POLLUTION H. R. 5975).
Hearing Subcomm. on Coast Guard and Navigation--Comm. on Merchant Marine and Fisheries, U. S. House of Representatives, 93d Cong, 2d Sess., p. 1-70, October 2,3, 1973. 70p.

Descriptors: *Legislation, *Oil pollution, *Disaters, *International waters, *Federal Water Pollution Control Act, Law of the sea, Oil industry, Foreign trade, Environmental effects, Coasts, Beaches, Structural engineering, Federal government, Foreign countries.
Identifiers: Convention on Oil Pollution in the High Seas, Oil pollution effects, Territorial seas, Energy crisis, Hearings, Ship structures.

H. R. 5975 implements the International Convention Relating to Intervention on the High Seas in Cases of Oil Pollution Casualties, 1969. The bill authorizes the Secretary of the Department in which the Coast Guard is operating to take such measures as are necessary to prevent, mitigate, or eliminate threats to the coastline or related interests from oil pollution resulting from maritime accidents beyond the territorial seas of the U. S. On October 2 and 3, 1973, the House Subcommittee on Coast Guard and Navigation heard representatives from the Coast Guard and Environmental Protection Agency (EPA) testify to support the bill. H.R. 5975 extends the authority of the federal government beyond that established under the Federal Water Pollution Control Act to international waters. Several witnesses testified that the vessel of a non-signatory nation would be subject to the Convention. The rights existing under the bill pertain only to governmental bodies. Private persons whose vessels or cargo suffer excessive damages due to intervention, may subject to state law, sue in a district court, or submit their claims to the Secretary of State for arbitration. The global energy shortage and increased size of oil tankers require enactment of the bill to minimize damage to marine and coastal environments and energy wastage coused by oil spills. (Jenkins-Florida)
W76-05205

TENNESSEE VALLEY AUTHORITY POLLUTION PREVENTION FACILITIES.
For primary bibliographic entry see Field 6E.
W76-05208

EXTENSION OF THE MARINE PROTECTION, RESEARCH AND SANCTUARIES ACT OF 1972.
Senate Comm. on Commerce, No. 93-1279, 93rd Cong., 2d Sess. Oct. 11, 1974. 6 p.

Descriptors: *Federal Government, *Legislation, *Waste disposal, *Water pollution control, *Oceans, Water, Water law, Legal aspects, Water pollution, Pollution, Wastes, United States, Governments, Costs, Permits, Waste dumps.
Identifiers: *Marine Protection Research, and Sanctuaries Act of 1972, *Ocean Dumping Act, International agreements, Territorial waters.

The Committee on Commerce has recommended passage of H.R. 15540 in order to extend for one year the authorization for appropriations implementing Title 1 of the Marine Protection, Research, and Sanctuaries Act of 1972. This statute, commonly referred to as the Ocean Dumping Act, is the Federal Government's mechanism for controlling and regulating the dumping of land-generated wastes at sea. The Act imposes specific research resonsibilities on the National Oceanic and Atmospheric Administration, in addition to the general permit responsibility of the Environmental Protection Agency and of the Army Corps of Engineers. The Act is being extended for one year to enable the Committee to conduct oversight hearings during the first session of the 94th Congress. Further extension will depend on the findings from such congressional investigation. The Committee estimates that the additional cost to the government as a result of the enactment of this legislation would not be more than $5.5 million for one year. Agency comments from the Environmental Protection Agency, the Council on Environmental Quality, the Department of Justice, and the Department of Commerce are included in this report. (Schilling-Florida)
W76-05209

REGULATION ADOPTING EFFLUENT LIMITAIONS AND GUIDELINES FOR WASTEWATER DISCHARGES TO THE SURFACE WATERS OF NORTH CAROLINA.
North Carolina Dept. of Natural and Economic Resources, Raleigh. Div. of Environmental Management.
Regulation of North Carolina Environmental Management Commission, March 20, 1975. 148 p.

Descriptors: *Surface waters, *Federal Water Pollution Control Act, *Effluents, *Standards, *North Carolina, Regulation, Waste water disposal, Waste water treatment, Water quality control, Water policy, Intergovernmental relations, Sewage effluents, Water pollution, Municipal wastes, Industrial wastes, Environmental control, Adoption of practices, Administrative agencies, Outlets, Domestic wastes, Streams.
Identifiers: Effluent standards, Pretreatment facilities.

This regulation authorizes and directs the North Carolina Environmental Management Commission to develop, adopt, modify and revoke effluent standards as necessary to prevent, abate and control water pollution. Limits are established for all effluents discharged from pretreatment facilities, outlets and point sources into state surface waters. The limits have been adopted from those promulgated by the Environmental Protection Agency (EPA) pursuant to the Federal Water Pollution Control Act. The North Carolina regulation provides effluent limits for all municipal wastewater discharges, including both domestic and industrial wastewater. In addition, the regulation restricts discharge into stream segments designated as 'effluent limited segments' by requiring approval by the Commission Director. (Hoffman-Florida)
W76-05212

WASHINGTON WASTES DISCHARGE PERMITS.
Washington Pollution Control Commission, Olympia.
For primary bibliographic entry see Field 6E.
W76-05214

OIL SPILLAGE REGULATION.
For primary bibliographic entry see Field 6E.
W76-05215

WYOMING ENVIRONMENTAL QUALITY ACT,
For primary bibliographic entry see Field 6E.
W76-05216

WYOMING PROTECTION OF PUBLIC WATER SUPPLY ACT,
For primary bibliographic entry see Field 6E.
W76-05217

MONTANA ENVIRONMENTAL POLICY ACT,
Montana Environmental Quality Council, Helena.
For primary bibliographic entry see Field 6E.
W76-05218

NEBRASKA DOMESTIC AND INDUSTRIAL LIQUID WASTES DISPOSAL RULES.
Nebraska Environmental Control Council, Lincoln.
For primary bibliographic entry see Field 6E.
W76-05219

KANSAS AGRICULTURAL WASTES REGULATIONS.
For primary bibliographic entry see Field 6E.
W76-05220

MICHIGAN GENERAL PROVISIONS AND PROCEDURES REGULATIONS.
Michigan Dept. of Natural Resources, Lansing. Water Resources Commission.
For primary bibliographic entry see Field 6E.
W76-05221

LICENSING AND REGULATION OF USE OF OIL SPILL CLEANUP AGENTS.
For primary bibliographic entry see Field 6E.
W76-05222

FEDERAL LEGISLATION AND COMMON LAW ASPECTS OF ENVIRONMENTAL PROBLEMS IN CANADA,
Atlantic Richfield Canada Ltd., Calgary (Alberta).
For primary bibliographic entry see Field 6E.
W76-05231

HEALTH ASPECTS OF UNCOVERED RESERVOIRS,
Washington State Dept. of Social and Health Services, Olympia.
For primary bibliographic entry see Field 5F.
W76-05232

EVALUATION OF STATE DRINKING-WATER-QUALITY SURVEILLANCE PROGRAMS,
Environmental Protection Agency, Atlanta, Ga. Region IV.
D. H. Taylor, and G. D. Hutchinson.
American Water Works Association Journal, Vol. 67, No. 8, p. 428-431, August, 1975. 4 p, 1 illus, 5 tab, 11 ref.

Descriptors: *Water supply, *Potable water, *Environmental sanitation, *Water distribution(Applied), *Water purification, Chlorination, Florida, Tennessee, Kentucky, Georgia, Evaluation, On-site investigations, Surveys, Quality control, Water analysis, Costs, Regulation, Water quality standards, Planning.
Identifiers: *Drinking Water Standards, Public Health Standards.

Four state water-supply programs were the subject of a recently concluded Environmental Protection Agency (EPA) study. The study had been initiated to evaluate the effectiveness of the state programs and to make recommendations as to how they could be improved. Areas reviewed included: the framework of water-supply statutes within which the programs operated; the staffing and leadership of the programs; educational opportunities for water-utility operators; and the overall effectiveness and capabilities of bateriological and chemical laboratories. The effectiveness of the program, however, was measured largely on the basis of drinking water quality, adequacy and condition of water-system facilities, and water-supply surveillance. The results of the study showed that numerous deficiencies existed, including: lack of top level quality personnel; failure to meet bacteriological water quality standards; inadequate engineering inspections of system facilities, failure to maintain a chlorine residual throughout the distribution system; and inadequate employee training. While the study noted that there were numerous factors contributing to these deficiencies, it singled out inadequate funding as the primary problem. Unless this funding problem is resolved, the study saw little chance for improvement in water quality programs. (Jenkins-Florida)
W76-05233

PERMITS FOR CONSTRUCTION BELOW HIGH WATER MARK.
South Carolina State Budget and Control Board, Columbia.
For primary bibliographic entry see Field 6E.
W76-05240

HEAT DISSIPATION FROM TURBULENT OPEN CHANNEL FLOW,
Georgia Inst. of Tech., Atlanta. School of Civil Engineering.
For primary bibliographic entry see Field 5B.
W76-05248

THE TRI-STATE COASTAL ZONE MANAGEMENT PERSPECTIVES.
Tri-State Regional Planning Commission, New York.
For primary bibliographic entry see Field 6G.
W76-05260

FIELD-LEVEL PLANNING FOR AREAWIDE WASTE TREATMENT MANAGEMENT: A MODEL FOR PLANNING UNDER SECTION 208 OF THE FEDERAL WATER POLLUTION CONTROL ACT,
North Carolina Univ., Chapel Hill. Dept. of City and Regional Planning.
For primary bibliographic entry see Field 5D.
W76-05261

THE LARGE-SCALE REGIONAL PLANT HYPOTHESIS: DISCRIMINANT ANALYSIS,
Kentucky Univ., Lexington. Dept. of Economics.
J. R. Marsden, D. E. Pingry, and A. Whinston.
Water Resources Research, Vol. 11, No. 6, p 1013-1017, December 1975. 1 fig, 4 tab, 2 equ, 5 ref. OWRT A-024-IND(10).

Descriptors: *Data collections, Analysis, *Treatment facilities, *Water quality control, Regions, Efficiencies, Activated sludge, Economics, Costs, Biochemical oxygen demand, Equations, Systems analysis, Classification, Waste water treatment, Regional analysis.
Identifiers: *Discriminant analysis.

Since their inception, controversy has surrounded the federal Water Pollution Control Act amendments of 1972, especially those sections dealing with basin and regional planning of desired water quality and treatment procedures. Implementation of pollution control acts requires the compilation of vast amounts of data. This paper considers the use of discriminant analysis for analyzing the consistency of data. Focusing on the predictive uses of the technique, the development of classification procedures is discussed for use in considering hypotheses concerning economies of scale and relative large-scale efficiency in treatment facilities. Considered is the hypothesis that large-scale (regional plants) possess certain characteristics which provide lower average cost benefits . The problem studied employs classes of treatment plants separated by average cost of treatment, using data for activated sludge plants varying in design size from 0.2 to 60 mgd. To conclude , this classification technique can provide a cheap and very easy method for initial considerations of questions concerning the advantage of large-scale or regional plants. Results ran according to the 'lowering average cost' arguments (higher-rate plants yield lower average costs). Lower average cost plants also tend to average higher MGT (million gallons treated). (Bell-Cornell)
W76-05267

MEETING EPA STANDARDS WITH REVERSE OSMOSIS,
Universal Oil Products Co., Del Mar, Calif. Roga Div.
For primary bibliographic entry see Field 5D.
W76-05295

FIGHT FLOATABLES WITH CHEMICALS,
Gannett, Fleming, Corddry and Carpenter, Inc., Harrisburg, Pa. Applied Science Group.
For primary bibliographic entry see Field 5D.
W76-05305

OIL-WATER SEPARATOR.
Netherlands Patent NL 7305-409. Issued October 22, 1974. Derwent Netherlands Patents Abstracts, Vol. V, No. 45, p H1, December, 1974.

Descriptors: *Patents, *Separation techniques, *Oil wastes, Waste water treatment, Oil pollution, Equipment, Water pollution control, Pollution abatement.
Identifiers: *Oil/water separator.

An oil/water separator has been patented. It is designed for the purification of oil polluted water and the subsequent recovery of the oil. The process involves separating from water the materials of lower density, such as oil, that can form different phases with the water. Oily water is passed to a collecting bell situated in the stream of water. The less dense impurity is then discharged through this bell. (Orr-FIRL)
W76-05306

TREATMENT OF WASTE OIL AT THE KEIHIN WORKS--NIPPON KOKAN,
Keihin Works, Kawasaki (Japan).
For primary bibliographic entry see Field 5D.
W76-05312

COMPLETE WATEREUSE, INDUSTRY'S OPPORTUNITY.
American Inst. of Chemical Engineers, New York.
For primary bibliographic entry see Field 5D.
W76-05314

THE RATIONALE OF ZERO DISCHARGE,
For primary bibliographic entry see Field 5D.
W76-05315

CLEARING UP THINKING ON POLLUTION LAWS,
P. J. Fannin.
In: Complete WateRuse: Industry's Opportunity, April 23-27, 1973, American Institute of Chemical Engineers and Environmental Protection Agency--Technology Transfer.

Descriptors: *Water utilization, *Water reuse, Legal aspects, Legislation, Water pollution control, Costs, Economics.
Identifiers: Legislation effects.

An address was given on the political aspects of water use. The tasks of a politician today are made difficult by various factors such as: the proliferation of scientific information; the abundance of people proposing new goals and regulations; and the influence of the mass media. Environmental legislation should follow a certain process; the problem should be determined; the costs to reach the solutions should be evaluated; and targets and a schedule that can be afforded should be set. A major concern should be the social and economic costs of environmental goals. The energy crisis should also be considered. Oil cannot be imported if prices on exports are inflated by the high costs of pollution control. Pollutant removal can have a negative environmental effect if too much energy and resources are required to remove pollutants and if more pollution is caused by the process. The cost of cleaning the final small fraction of pollutants can be exorbitant. Economic impacts of pollution control usually occur in small communities which can least afford them. Optimum solutions will result from the combination of economics, efficiency, and technology. The reuse of resources, including water, is advocated.(See also W76-05314) (Pinto-FIRL)
W76-05316

UPGRADING WASTEWATER STABILIZATION PONDS TO MEET NEW DISCHARGE STANDARDS.
Utah Water Research Lab., Logan.
For primary bibliographic entry see Field 5D.
W76-05319

PROGRESS REPORT: BLUE SPRINGS LAGOON STUDY, BLUE SPRINGS, MISSOURI,
Environmental Protection Agency, Kansas City, Kans. Water Quality Lab.
For primary bibliographic entry see Field 5D.
W76-05323

COST-EFFECTIVENESS ANALYSIS FOR WATER POLLUTION CONTROL,
National Environmental Research Center, Cincinnati, Ohio.
For primary bibliographic entry see Field 5D.
W76-05324

THE SOCIAL WELL-BEING AND QUALITY OF LIFE DIMENSION IN WATER RESOURCES PLANNING AND DEVELOPMENT.
Utah State Univ., Logan. Inst. for Social Science Research on Natural Resources.
For primary bibliographic entry see Field 6B.
W76-05354

SOCIAL WELL-BEING: PROBLEMS AND PROSPECTS,
Oregon State Univ., Corvallis. Dept. of Anthropology.
For primary bibliographic entry see Field 6B.
W76-05368

PUBLIC PARTICIPATION IN WATER AND WASTE WATER PLANNING,
Clemson Univ., S. C. Dept. of Environmental Systems Engineering.
For primary bibliographic entry see Field 6B.
W76-05371

WESTERNPORT BAY ENVIRONMENTAL STUDY 1973-1974.
Victoria Ministry for Conservation, Melbourne (Australia). Westernport Bay Environmental Study.
For primary bibliographic entry see Field 6G.
W76-05404

AN ASSESSMENT OF EUTROPHICATION IN AUSTRALIAN INLAND WATERS,
Department of Environment, Canberra (Australia).
For primary bibliographic entry see Field 5C.
W76-05405

EFFECTS OF AIR INJECTION AT PROMPTON LAKE, WAYNE COUNTY, PENNSYLVANIA,
Geological Survey, Harrisburg, Pa.
J. L. Barker.
Journal of Research of the U S Geological Survey, Vol 4, No 1, p 19-25, January-February 1976. 6 fig, 4 tab, 12 ref.

Descriptors: *Aeration, *Hypolimnion, *Lakes, *Pennsylvania, Mixing, Water temperature, Dissolved solids, Dissolved oxygen, Nitrogen, Anabaena, Data collections, Evaluation, Hypolimnion, Air pollution effects.
Identifiers: *Prompton Lake(Pa), *Air injection(Lakes).

Air injected into the hypolimnion of Prompton Lake, Wayne County, Pa., at a maximum rate of 210 cubic feet per minute (6 cubic metres per minute) during a 65-day period (July 27 to September 30, 1973) produced the following results: (1) With cooler air temperatures prevailing, the mean subsurface temperature increased by 4.0 deg C compared with the same period in 1972, (2) although chemical and thermal destratification was incomplete, 6 weeks of air injection increased the dissolved-oxygen concentration of the entire tropholytic zone to more than 4 milligrams per litre, (3) concentrations of nitrogen increased in the trophogenic zone during air injection, and (4) Anabaena flos-aquae attained cell concentrations in excess of 4,500 per millilitre during air injection. (Woodard-USGS)
W76-05413

AN INTERNATIONAL CENTRE FOR MANATEE RESEARCH.
National Academy of Sciences, Washington, D.C.
For primary bibliographic entry see Field 4A.
W76-05433

A METHOD FOR APPLYING RESEARCH TO ENVIRONMENTAL PLANNING AND MANAGEMENT: A CASE STUDY OF ISSUES IMPORTANT TO THE CHESAPEAKE BAY REGION,
Center for the Environment and Man, Inc., Hartford, Conn.
For primary bibliographic entry see Field 6B.
W76-05434

LEFT BEHIND--SOVIET MINE WASTES,
N. Precoda.
Environment, Vol. 17, No. 8, p. 14-20, 1975. 24 ref.

Descriptors: *Environmental effects, *Foreign countries, *Mine wastes, *Mining, Quarries, *Strip mine wastes, Land Reclamation.
Identifiers: *USSR, Zambia.

Mining and quarrying operations in the USSR have severely damaged the land, and surface and underground water systems. About 5.5 million acres are covered by abandoned and operating surface mines alone increasing by nearly 100,000 acres every year. Land has also been consumed by reservoirs, highway systems, growing cities, and expanding industries, but mining operations have been the most disruptive. Disposal of tailings and other wastes needs special attention when the mining operations are in mountainous areas. Examples are given of coal and iron mining and quarrying in the Caucasian Mineral Waters Region; iron ore mining in the Kursk Magnetic Anomaly; mining of coal, manganese, and many other minerals in the Donbass Basin Area; and surface coal mining in the Kuznetz Coal Basin. Concern is expressed for the top layers of soil which are being destroyed by erosion, mining, and quarrying. In contrast to this despoliation of land the Soviet Union is making tremendous efforts to increase and improve agricultural lands. There is a crucial need in both the U.S. and USSR to change their attitudes toward reclamation of mined areas. Knowledge and resources are available to renovate used land. Conversely Zambia has allocated a large share of its national resources to the repair of land damaged by mining. (Buchanan-Davidson--Wisconsin)
W76-05437

A STUDY OF HOW WATER QUALITY FACTORS CAN BE INCORPORATED INTO WATER SUPPLY ANALYSIS.
Ernst and Ernst, Washington, D.C.
Corps of Engineers Institute for Water Resources Contract Report 74-2, July 1973. 167 p, 7 fig, 8 tab, 40 ref, append. DACW71-72-C-0053.

Descriptors: *Methodology, *Water quality, *Water supply, *Water demand, Treatment facilities, Optimization, Marginal costs, Linear programming, Mathematical models, Water treatment, Cost analysis, Water users, Resource allocation.

A conceptual framework and methodology for explicitly incorporating water quality factors into the supply and demand functions of water and resource allocation problems is developed and illustrated. A microeconmics approach using constrained optimization is employed. The water-supply function is developed by means of a classical economics model (CEM) derivation of a treatment plant's marginal cost function; this enables computation of the marginal cost of removing incremental amounts of a water impairment. A linear programming model (LPM) is developed to demonstrate how it is possible to depict internal behavior of a water-using producer who can alter the effective supply by upgrading lower quality water to acceptable quality. Actual data were used in the CEM to help estimate a sample cost function, while dummy data was used to demonstrate the sensitivity analysis capabilities of the LPM. Costs of removing water contaminants can be estimated with both models. Water demand functions are also developed and illustrated. Combining these with the CEM examples, the sensitivity of 'marginal revenue equals marginal cost' equilibrium to water quality parameter shifts is examined by means of comparative statistics analysis. (Luedtke-Wisconsin).
W76-05440

COST ALLOCATION FOR A REGIONAL POLLUTION TREATMENT SYSTEM,
Florida Univ., Gainesville, Dept. of Agricultural Economics.
E. Loehman, D. Pingry, and A. Whinston.
In: Economics and Decision Making for Environmental Quality, J. R. Conner and E. Loehman, Eds., Gainesville University Press of Florida, 1974, p 223-249. 3 fig, 9 tab, 14 equ, 9 ref. OWRT B-020IND(192)-14-31-0001-3080.

Descriptors: *River basins, *Cost allocation, *Waste disposal, *Water pollution control, *Economic efficiency, *Waste treatment, Optimization, Water quality, Standards, Flow, Physical properties, Financing, Taxes, Equations, Effluents, Pricing, Pollution abatement, Constraints, Alternative planning, Mathematical models, Systems analysis, Treatment, Structures, *Indiana, Regional analysis.

Identifiers: *Nonlinear programming, *Cost minimization, West Fork White River(Ind).

Considered is the problem of allocating the waste disposal capacity of a river basin. A model predicts water quality in a river as a function of flow and physical characteristics and gives costs of treatment on site for polluters along the river and in regional treatment plants. Nonlinear programming is used to minimize the sum of construction, operation and maintenance costs of all treatment structures; subject to maintaining the required level of water quality under given institutional and physical constraints, the least-cost combination of treatment alternatives is considered. Discussed is how to implement and finance a basin-wide system--specifically, how to achieve a minimum-cost regional solution through taxation and incentive systems. Considered is the problem where joint use of facilities by polluters causes difficulties in how to assign costs to the individual polluters. Previous pricing proposals are discussed with attention paid to shadow or marginal prices, and a new method of cost allocation is presented: a system of finance which would provide incentives for regional treatment plants. The cost allocation and pricing mechanisms are discussed regarding equity considerations and revenue-raising capability. The relationship between equity and 'damage cause' is examined. An application of the programming and cost allocation model to the West Fork White River in Indiana is given. (See also W73-02937) (Bell-Cornell)
W76-05442

INTERNATIONAL EXTERNALITIES AND OPTIMAL TAX STRUCTURES,
University of Western Ontario, London.
J. R. Markusen.
Journal of International Economics, Vol. 5, No. 1, p. 15-29, 1975. 2 tab, 11 ref.

Descriptors: *Tariff, *Mathematical models, *Pollution taxes(Charges), *Foreign trade, *International waters, Water pollution control, Air pollution, Pollution abatement, Model studies, Cost repayment.
Identifiers: *Externalities, *International pollution, Inter-regional pollution.

The problems of international pollution and the depletion of international common ocean property resources differ from the usual types of externality situations because of the restricted ability of one government to intervene in the internal affairs of another country. A model is developed applicable to two countries in a trading relationship which attempts to incorporate the underlying similarities of a wide range of problems characterized by externalities between national and regional decision making bodies. The model assumes a situation in which one country is affected by an eyesore type pollution externality generated by production processes. It is assumed that the only tool available to maximize a social welfare function is a tax structure composed of production/consumption and tariffs/subsidies. The model solves and interprets a set of necessary conditions which must be satisfied by an optimal tax structure which will maximize social welfare. Then the model is applied to distortions and optimal tax structures when the first best optimum cannot be attained. The model also serves as a vehicle to discuss a situation where only one policy instrument is available to deal with several distortions simultaneously. Several situations in which first best solutions are unavailable due to institutional constraints are considered. (Auen-Wisconsin).
W76-05446

IMPACT OF THE SAFE DRINKING WATER ACT,
Environmental Protection Agency. Washington, D. C.
J. R. Quarles, Jr.
Journal American Water Works Association, Vol. 65, No. 2, p. 69-70, February 1976.

Descriptors: *Legislation, *Administration, *Water quality control, Monitoring, *Potable water, Regulation, Water quality standards, Water law, Coordination, State governments, Local governments.
Identifiers: *Safe Drinking Water Act of 1974.

The Safe Drinking Water Act of 1974 formalized the intention of upgrading drinking water and specified assignments that require cooperation from all levels of government, utilities, and, in fact, consumers. The new act is complicated because it requires the EPA issue regulations, requires state agencies to develop programs, and requires the people who run the drinking water systems to monitor drinking water quality and make improvements. The key to success of the act will be cooperation between the EPA and state and local governments. (Gass-NWWA)
W76-05449

STATE REGULATORY AGENCIES AND THE SAFE DRINKING WATER ACT,
New Jersey Dept. of Environmental Protection, Trenton, N. J. Bureau of Potable Water.
R. Barg.
Journal American Water Works Association, Vol. 68, No. 2, p. 70-72, February 1976.

Descriptors: *State governments, *Administrative agencies, *Legislation, *Government finance, *Potable water, Regulation, Public health, Water law, *Water supply, *Water quality standards.
Identifiers: PL 93-523, *Safe Water Drinking Water Act.

A year after the passage of PL 93-523, states have begun to realize the impact of the law, which means more state work than anticipated with a minimum of federal funding. The work required of the state to carry out the new law is described. The qualifications required if the state is to apply for a federal grant to carry out community water supply supervision are discussed. The need for federal administrators to recognize basic practical and financial constraints with respect to the operation of state programs that they seek to support is expressed. (Gass-NWWA)
W76-05450

MANAGEMENT OF WATER QUALITY THROUGH SELECTED INSTITUTIONS AND INSTRUMENTS,
Iowa State Univ., Ames. Dept. of Economics.
P. H. Spies.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-251 034, $10.00 in paper copy, $2.25 in microfiche. PhD thesis, 1973. 338 p, 12 fig, 21 tab, 3 append. OWRT B-015-IA (5).

Descriptors: *Management, *Water quality control, *Institutions, *Iowa, Rural areas, Decision making, Coordination, Pricing, Model studies, Social needs, Comprehensive planning, Standards, Pollution taxes(Charges), Costs, Equity, Water rights, Sediment control, Feasibility, Welfare(Economics), Economic efficiency, Pollution abatement, Resource allocation, Computer programs.
Identifiers: *Upper Skunk River Basin(Iowa), Externalities.

The importance and interrelationships of planning, organization-coordination, and control of water quality management are analyzed as applicable to the water quality problem in a rural area. Spillover effects on water quality management are identified and evaluated in terms of efficiency and equity, by analyzing resource allocation within market and property systems. A model was developed for maximizing social benefits subject to specific water quality restrictions and applied to the Upper Skunk River Basin in Central Iowa. An institutional framework for water quality control was developed. Water quality planning may be simplified by application of charges to point source pollutants and standards to diffused pollutants. To allow for optimal planning and allocation of water qualities over time, it may be necessary to specify rights in water qualities by tenure contracts between public and user. Water quality management should be the responsibility of regional planning groups. Research recommendations include the provision of data for relaxing assumptions imposed on the analysis and for the institutional design for water quality management; and a procedure is needed whereby an optimal relationship between charges and design flows can be established. For tenure contracts, procedures should be established whereby qualitative specifications and contract terms are coordinated to ensure resource use efficiency. Development of procedures to establish functional resource management regions is recommended. (Buchanan-Davidson--Wisconsin)
W76-05453

THE STATUS OF WATER POLLUTION CONTROL IN THE SOVIET UNION, (FIRST PART),
Crown Zellerbach Corp., Camas, Wash. Environmental Services Div.
For primary bibliographic entry see Field 5D.
W76-05483

THE STATUS OF WATER POLLUTION CONTROL IN THE SOVIET UNION, (SECOND PART),
Crown Zellerbach Corp., Camas, Wash. Environmental Services.
For primary bibliographic entry see Field 5D.
W76-05484

OXIDATION UNIT CUTS DOWN ODOR FROM KRAFT PULP MILLS,
Groupement de la Cellulose, Saint-Gaudens (France).
For primary bibliographic entry see Field 5D.
W76-05486

6. WATER RESOURCES PLANNING

6A. Techniques Of Planning

ECONOMIC IMPACT OF FISCAL CONSTRAINTS ON WATER PROJECT CONSTRUCTION, USER'S GUIDE.
Harza Engineering Co., Chicago, Ill.
For primary bibliographic entry see Field 6B.
W76-05001

ECONOMIC IMPACT OF FISCAL CONSTRAINTS ON WATER PROJECT CONSTRUCTION, (CARD DECK).
Harza Engineering Co., Chicago, Ill.
For primary bibliographic entry see Field 6B.
W76-05002

STOCHASTIC PROJECTIONS FOR WATER RESOURCES PLANNING,
Texas Univ. at Austin. Center for Research in Water Resources.
L. R. Beard, and S. Chang.
Available from the National Technical Information Service, Springfield, Va. 22161, as PB-250 150, $6.75 in paper copy, $2.25 in microfiche copy. Publication No. CRWR 131, November 1975. 153 p, 62 fig, 1 tab, 6 ref, 2 append. OWRT C-5340-X(No. 9088)(2).

Descriptors: *Time series analysis, *Stochastic processes, Water resources, *Planning, *Forecasting, *Projections, Probability, Streamflow, Interest rate, Gross national product, Algorithms, Model studies, *Computer models, Computer programs, Benefits, Costs.

Identifiers: Autoregressive-integrated-moving average processes, *Principal component analysis, Multivariate projections.

Computerized algorithms were developed for finding the best stochastic projection models for single variable projections and for simultaneous multivariate projections. A large number of independent projections of a single variable or a group of variables can be generated by the proposed algorithms to represent a range of future projections. Procedures, techniques, and criteria for evaluating the future benefits and costs of a water resources project on the basis of the entire range of future projections as contrasted with the conventional single most likely forcast were discussed. For single variable projection, the best model was selected by the algorithm from the autoregressive-integrated-moving average family of models on the basis of goodness of fit with observed data and reasonableness of projections. For multivariate projections, principal component analysis was allied with the single variable projections, principal component analysis was allied with the single variable projection technique to produce simultaneous projections of all variables. Projections of thirty one sample series were presented. Two FORTRAN computer program used in the sample series projections were listed.
W76-05012

CAPABILITY OF INTEGER PROGRAMMING ALGORITHMS IN SOLVING WATER RESOURCE PLANNING PROBLEMS,
Utah Center for Water Resources Research, Logan.
T. C. Hughes, W. J. Grenney, A. B. Bishop, C. G. Clyde, and R. Narayanan.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-250 499, $5.50 in paper copy, $2.25 in microfiche. Utah Water Research Laboratory Publication PRWG175-1, January 1976. 101 p, 5 fig, 13 tab, 59 ref, 12 append. OWRT B-125-UTAH(1). 14-34-0001-6127.

Descriptors: *Water resources, Planning, *Water supply, *Algorithms, *Operations research, River basins, *Optimum development plans, Utah, *Regional analysis, Model studies, Water quality.
Identifiers: *Integer programming, Cache Valley(Utah).

The feasibility of optimizing large regional water resource planning problems by means of integer programming algorithms is analyzed. Two types of integer programming models are developed: (1) A water supply model including 23 separate but geographically related community systems; and (2) a river basin water quality model including 15 point sources of wastewater, 4 types of pollutants, 6 surveillance points, and 7 alternative treatment processes. The water supply model was structured as a mixed integer problem (some continuous variables included) while the water quality model was an all integer problem. Four integer programming algorithms were tested on the sample problems as follows: (1) MXINT - The Burroughs B6700 TEMPO package algorithm; (2) FMPS-MIP - The UNIVAC 1108 MPS package algorithm; (3) GMINT - A proprietary algorithm authored by A. M. Geoffrion and R. D. McBride; and (4) AIP - A 0,1 algorithm which uses the Balas additive concept. Several versions (sizes) of both problems were successfully solved by one or more of the algorithms with computational efforts ranging from less than 1 to more than 40 minutes of CPU time.
W76-05183

WATER AS A FACTOR IN ENERGY RESOURCES DEVELOPMENT,
Utah Center for Water Resources Research, Logan.
For primary bibliographic entry see Field 6B.
W76-05250

A RATIONAL APPROACH TO DECISION MAKING IN THE REGIONALIZATION OF WASTEWATER TREATMENT SYSTEMS,
Pittsburgh Univ., Pa. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5D.
W76-05251

RURAL RESIDENTIAL WATER DEMAND IN KENTUCKY: AN ECONOMETRIC AND SIMULATION ANALYSIS,
Kentucky Water Resources Research Inst., Lexington.
For primary bibliographic entry see Field 6D.
W76-05252

SCREENING MODEL FOR CONJUNCTIVE-USE WATER SYSTEMS,
Harza Engineering Co., Chicago, Ill.
For primary bibliographic entry see Field 4A.
W76-05268

A SUMMARY OF SOCIOLOGICAL STUDIES OF WATER RESOURCES DEALING WITH SOCIAL GOALS AND THE QUALITY OF LIFE: 'THE STRAWMAN' AND OTHER STUDIES,
Kentucky Agricultural Experiment Station, Lexington.
For primary bibliographic entry see Field 6B.
W76-05361

METHODOLOGICAL STRATEGIES FOR EVALUATING THE EFFECT OF WATER RESOURCES ON SOCIAL WELL-BEING AND QUALITY OF LIFE,
Wisconsin Univ., Madison. Dept. of Rural Sociology.
T. A. Heberlein.
In: The Social Well-being and Quality of Life Dimension in Water Resources Planning and Development. Proceedings: Conference of University Council on Water Resources, July 10-12, 1973, Utah State University, Logan. p 89-100, 1 fig, 64 ref, 1 append.

Descriptors: Water resources, *Research and development, *Methodology, *Attitudes, Analytical techniques, Measurement, Evaluation, Decision making, *Planning, Testing procedures, Social aspects, Analysis.
Identifiers: *Likert scale, Study design, *Quality of life, Case studies, Experimentation, Guttman scale, Thurstone scale, Verification, *Social well-being, Path analysis, Validity.

Suggestions are made for improving methodology. (1) Study reliability must be estimated, for if reliability is low the observed impacts of variables may be attenuated leading to incorrect estimates. Self-report attitude scales like the Thurstone, Guttman and Likert scales are not equally reliable. Factor analysis can be used to test validity. (2) Study design is important. Field experiments can be useful because of the amount of information yielded, but their cost may have to be justified to administrators. (3) Prospective analysis should be looked at early in order to get the most out of collected data. Much information goes unused. Use of correlation and regression is encouraged because of their power to indicate relationships. Path analysis, which is a combining of a set of regression equations into an integrated and systematic form, can be useful to give a pictoral representation of relationships, and path regression coefficients are directly related to policy. An appendix gives an example of estimating reliability. (See also W76-0354) (Smith-North-Carolina)
W76-05362

TOWARD A QUANTITATIVE MEASURE OF THE QUALITY OF LIFE,
Michigan State Univ., East Lansing. Dept. of Sociology.
K. E. Hornback, and R. W. Shaw, Jr.
In: The Social Well-being and Quality of Life Dimension in Water Resources Planning and Development, Proceedings: Conference of University Council on Water Resources, July 10-121 1973, Utah State Univ., Logan. p 101-116, 2 fig, 26 ref, 1 append.

Descriptors: *Evaluation, *Social impact, Analytical techniques, *Indicators, *Measurement, Social aspects, Decision making, Planning.
Identifiers: *Quality of Life, Objective measures, Subjective measures.

Quality of life (Q0L) is not a simple linear function that can be measured by any one measure. Q0L is viewed as being a function of the objective conditions appropriate to a selected population and the subjective attitude toward those conditions held by persons. The proposed quantitative scheme rests on assignment of objective and subjective values to Q0L factors from a factor list which is comprehensive, non-redundant, applicable to objective and subjective conditions, and uni-dimensional. An index must be built from parameters which can measure efficiently important states of the system. Indicators with a high correlation with Q0L are particularly important. Indicators must be applicable to a large population, should not be dysfunctional, should be reliable and repeatable, and based on data collected for the purpose. Objective measures are to be transformed to a 1 to 10 scale. For each individual the correlation between these measures is obtained and the factors are weighted. These parameters are combined into a reasonable expression for the factor index which describes the state of the factor and its importance. Ten population characteristics are to be collected for each individual including location, education, age, etc., so that objective and subjective measures can be arrayed against these characteristics to evaluate QOL for particular subsets. A time series analysis will be possible which has implications for government policy. There is an indication that aggregation of QOL obscures individual variation and therefore is of less use. Proposed methods have implications for determination of QOL changes, planning allocation of resources and policy evaluation. (See also W76-05354) (Smith-North Carolina)
W76-05363

HYDROLOGIC SEMANTICS,
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 2A.
W76-05414

AN ANALYSIS OF WATER RESOURCE BENEFIT DETERMINATION METHODS WITH SPECIAL REFERENCE TO THE COSUMNES RIVER DIVISION PROJECT,
California Univ., Davis. Dept. of Agricultural Economics.
For primary bibliographic entry see Field 6B.
W76-05441

COST ALLOCATION FOR A REGIONAL POLLUTION TREATMENT SYSTEM,
Florida Univ., Gainesville, Dept. of Agricultural Economics.
For primary bibliographic entry see Field 5G.
W76-05442

WATER RESOURCES DEVELOPMENT IN THE TISZA RIVER BASIN AND ITS IMPACT ON SOCIO-ECONOMIC GROWTH,
Water Management Center, Budapest (Hungary). Dept. of Long Range Planning.
For primary bibliographic entry see Field 4A.
W76-05519

6B. Evaluation Process

ECONOMIC IMPACT OF FISCAL CONSTRAINTS ON WATER PROJECT CONSTRUCTION, USER'S GUIDE.
Harza Engineering Co., Chicago, Ill.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-251 326, $6.00 in paper copy, $2.25 in microfiche. October 1975. 140 p, 15 fig, 13 tab, 11 ref, append. For model on magnetic tape see PB-251 327. OWRT C-7229(No. 6200)(1).

Descriptors: *Economic impacts, *Fiscal constraints, *Projects, *Computer programs, Construction, Budget, Benefits, Costs, Present worth, Kentucky, Interest rates, Data collections, *Model studies, California, *Computer models.
Identifiers: *Construction stretch-outs, User guidelines, Data collection forms, Cave Run Lake Project(Ky), Auburn-Folsom South Unit(Calif).

The primary objective was to develop a tool for use by high level policy and budgetary decision-makers in the Office of Management and Budget, Department of the Interior, and Department of the Army in determining the economic impacts of fiscal constraints on water project construction. A computerized model was developed and tested on the Cave Run Lake Project, Kentucky, and the Auburn-Folsom South Unit, California. On the basis of the test results, it was concluded the model yields satisfactory estimates of benefit losses and changes in economic costs associated with construction stretch-outs and delays resulting from fiscal constraints. The model performs an economic analysis of a given project with and without fiscal constraints. The without situation corresponds to full funding of the construction program. The with situation corresponds to a reduced level of funding either in the budget year under review or in subsequent years. The model measures the changes in benefits, construction costs, related non-project costs, operation and maintenance costs, and flood damage risk associated with these alternative funding scenarios. The present worth of the net benefits and costs are computed for a range of interest rates to test the sensitivity of economic impacts to changes in the interest rate. A brief description of the main program and the subroutine is included in the technical appendix to the report. Whenever flow charts are needed they are included. A general flow chart of the main program is included. A computer program listing is included in the part of the appendix.(See also W76-05002)
W76-05001

ECONOMIC IMPACT OF FISCAL CONSTRAINTS ON WATER PROJECT CONSTRUCTION, (CARD DECK).
Harza Engineering Co., Chicago, Ill.
Available from the National Technical Information Service, Springfield, Va. 22161, as PB-251 327 $200.00/year domestic, $250.00/year foreign. October 1975. (1,121 punched cards.) Available in Mag. Tape: PB-251 327. Specify recording mode when ordering. OWRT C-7229(No. 6200)(1).

Descriptors: *Economic impacts, *Fiscal constraints, *Projects, *Computer programs, Construction, Budget, Benefits, Costs, Present worth, Kentucky, Interest rates, Data collections, *Model studies, California, *Computer models.
Identifiers: *Construction stretch-outs, User guidelines, Data collection forms, Cave Run Lake Project(Ky), Auburn-Folsom South Unit(Calif).

The program is written in Fortran IV language and it is a self-sufficient program, i.e., it does not need any auxillary storage. The main program reads the basic data pertaining to the overall project and executes the model by calling the different subroutines in the appropriate order. (See also W76-05001)
W76-05002

STOCHASTIC PROJECTIONS FOR WATER RESOURCES PLANNING,
Texas Univ. at Austin. Center for Research in Water Resources.
For primary bibliographic entry see Field 6A.
W76-05012

RAIN DANCE DOESN'T WORK HERE ANYMORE, OR WATER USE AND CITIZEN ATTITUDES TOWARDS WATER USE IN ALBUQUERQUE, NEW MEXICO,
New Mexico Univ., Albuquerque. Div. of Governmental Research.
P. A. Lupsha, D. P. Schlegel, and R. U. Anderson.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-250 133, $4.50 in paper copy, $2.25 in microfiche. Publication No. 84, December 1975. 50 p, 5 fig, 43 tab, 23 ref, append. OWRT B-040-NMEX(1).

Descriptors: *Urban sociology, *Attitudes, *Water consumption, Economics, *Water values, *Water rates, Domestic water, Water policy, Water conservation, *Water utilization, Water control, Cities, Utilities, Zoning, City planning, *New Mexico, *Water demand.
Identifiers: Water use patterns, Water using appliances, Vegetable gardens, Desert landscaping, Albuquerque(N Mex).

345 respondents in single family residencies were interviewed, and their attitudes towards water use compared with data from the computerized records of the city of Albuquerque on their actual water consumption. This comparative use data then formed the basis for attempting to discover what were the major factors in residential use in Albuquerque. Economic variables such as income, house value and lot size were the key factors in high water demand. The number of persons in the household proved to be the only significant sociological variable in creating high demand. The cultural variable of ethnicity appeared to have an impact on use, even when controlled for income. Landscape type and sprinkling system have significant impact on water demand. The city has a number of policy alternatives toward water use and water charges. In developing these policy alternatives, one must be aware of the interdependencies and the tradeoffs involved. A number of variables have an impact on demand. These variables should be amendable to a programmed scenario of pricing, conservation education and legal or zoning changes which could all be used to significantly lower water use and demand in the city. (Hain-New Mexico State)
W76-05016

ENVIRONMENTAL PROTECTION IN CALIFORNIA: COURT ACTION POWERS OF STATE AND LOCAL GOVERNMENT ATTORNEYS,
For primary bibliographic entry see Field 6G.
W76-05189

COASTAL ZONE MANAGEMENT: THE PROCESS OF PROGRAM DEVELOPMENT,
Coastal Zone Management Inst., Sandwich, Mass.
J. Armstrong, H. Bissell, R. Davenport, J. Goodman, and M. Hershman.
Nov., 1974. 231 p, 13 fig, 5 tab, 380 ref, 3 append.

Descriptors: *Coasts, *Comprehensive planning, *Estuaries, *Water resources development, *State governments, Management, Regulation, Planning, Area redevelopment, Water management(Applied), Shore protection, Water policy, Public benefits, Public lands, Boundaries, Boundary disputes, Ecosystems, Ecology, Federal government, Jurisdiction, Water utilization, Priorities, Coordination, Projects, Administrative agencies, Water utilization.
Identifiers: *Coastal Zone Management Act of 1972, Public hearings.

The Coastal Zone Management Act of 1972 was enacted to encourage the coastal states to develop comprehensive coastal resources management programs which in turn would provide wise and effective management of the nation's coastal area. This document presents an in-depth discussion of the various elements of the Act and attendant regulations that the states must consider in developing their own program. It is broken down into five categories: (1) substantive elements; (2) authority and organization; (3) organization and use of information; (4) public participation; and (5) estuarine sanctuaries. Substantive elements covered include boundary determination, permissible uses, geographic areas of particular concern, and priority of uses. The authority section considers the means of exerting control, organizational structures, and problems involved in designing organization capabilities. The information section includes a consideration of the types of information needed, and the use and sources of existing information. A discussion of the potential of public hearings as a tool for the generation of new ideas is presented in the public participation section. The estuarine section discusses natural ecological units, estuarine sanctuary uses, and the relationship of shorelands to overall coastal zone management. (Hoffman-Florida)
W76-05204

WATER AS A FACTOR IN ENERGY RESOURCES DEVELOPMENT,
Utah Center for Water Resources Research, Logan.
A. B. Bishop, M. D. Chambers, W. O. Mace, and D. W. Mills.
Available from the National Technical Information Service, Springfield, Va 22161, as PB-250 750, $5.50 in paper copy, $2.25 in microfiche. Utah Water Research Laboratory Publication PRJER028-1, June 1975. 104 p, 42 fig, 39 tab, 47 ref. OWRT A-028-UTAH(1), 14-31-0001-5045.

Descriptors: Energy, Resources allocation, Linear programming, *Optimization, *Energy conversion, Water consumption, *Utah, *Water allocation(Policy), Colorado River Basin, Model studies.
Identifiers: *Colorado River Basin(Utah), *Energy resources development.

Water is a key input to western energy resource development. Particularly where water supplies are short and water quality degradation is a critical consideration, the water resource system conflicts associated with energy development at alternative sites need to be carefully examined. To demonstrate the model structure and capabilities, an application is made to the energy resource region within the Utah portion of the Colorado River Basin. Surface water resources available by stream reaches are designated, and the possible energy developments requiring water inputs, for both extraction and conversion processes, are located. For the initial application of the model, optimal solutions were obtained for both energy maximization and water minimization which illustrate composite system effects and potential conflicts that could arise from various combinations of water allocation to energy resources developments.
W76-05250

FIELD-LEVEL PLANNING FOR AREAWIDE WASTE TREATMENT MANAGEMENT: A MODEL FOR PLANNING UNDER SECTION 208 OF THE FEDERAL WATER POLLUTION CONTROL ACT,
North Carolina Univ., Chapel Hill. Dept. of City and Regional Planning.
For primary bibliographic entry see Field 5D.
W76-05261

SCREENING MODEL FOR CONJUNCTIVE-USE WATER SYSTEMS,
Harza Engineering Co., Chicago, Ill.
For primary bibliographic entry see Field 4A.

W76-05268

MANUAL FOR TRAINING IN THE APPLICATION OF THE PRINCIPLES AND STANDARDS OF THE WATER RESOURCES COUNCIL.
Colorado State Univ., Fort Collins. Environmental Resources Center.
For primary bibliographic entry see Field 9B.
W76-05348

THE ECONOMIC VALUE OF WATER FOR SELECTED USES IN SOUTHWESTERN NORTH DAKOTA,
North Dakota Water Resources Research Inst., Fargo.
G. C. Griffin.
Available from the National Technical Information Service, Springfield, Va 22161, as PB-250 885 $5.00 in paper copy, $2.25 in microfiche. Completion Report No. WI-221-034-76, February 1976, Part I, 73 p 1 fig, 59 tab, OWRT-A-041-NDAK(2) 14-31-0001-403, 5034.

Descriptors: *North Dakota, Evaluation, *Water utilization, *Economics, Electric power, Irrigation, Municipal water, Recreation, Alternative costs, Water supply, Water demand.
Identifiers: Southwestern, North Dakota.

Because of the lack of an active free market system for water, it is necessary to establish the economic value of water using economic analysis. Several approaches were reviewed before selecting those methods which were most appropriate for determining the value of water for different uses. The 'residual imputation' approach was employed for determining the value of water used in steam electric power, synthetic gas and irrigation. The 'alternative cost' method was used for determining municipal water supply values. Values of water were determined for the selected uses of industry (steam electric power generation and synthetic gas production), agriculture (irrigation), municipal water supply and recreation. Water used for steam electric power was valued at a range of $308.97 to $145.47 per acre-foot. Synthetic gas produced from coal yielded a water value of $306.45 per acre-foot. The value of water used for irrigation varied from $17.06 to $94.62 per acre-foot depending on the price level used in the analysis. The value of municipal water was placed at 58 cents/1000 gallons. Water value for recreation was based on user days which varied from $0.75 to $2.75 per user day. (See also W76-05351 and W76-05352).
W76-05350

DEVELOPMENT PRIORITIES IN THE WEST RIVER REGION, NORTH DAKOTA,
North Dakota Water Resources Research Inst., Fargo.
J. E. Bowes.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-250886, $6.75 in paper copy, $2.25 in microfiche. A-041-NDAK (4) 14-31-0001-5034, 4034 Completion Report, No. WI-221-034-76, Feb. 1976. Part III, 146 p, 44 fig, 26 tab, append.

Descriptors: *Social aspects, *Water resources development, Planning, *Area redevelopment, *North Dakota, *Attitudes, Community development, *Rural sociology, Priorities, Communication, Water management(Applied), Water pollution, Agriculture.
Identifiers: West River Diversion(N Dak), Coal development.

Social attitudes and degree of communication concerning development priorities in West River Region of North Dakota were analyzed using written surveys. There was limited awareness of the West River Diversion Project. Among those aware, problems identified included aspects of coal development, water management, pollution and agriculture. Federal agencies were more frequently criticized than state agencies as being unresponsive to local needs, but there was good correlation between problems identified by agencies and the general public. Information from agencies tended to diffuse indirectly and there was minimal communication among citizens with similar concerns. A series of suggestions are made to change the situation. (See also W76-05350 and W76-05351)
W76-05352

HOUSEHOLD WATER USE,
American Society of Civil Engineers, New York.
For primary bibliographic entry see Field 6D.
W76-05353

THE SOCIAL WELL-BEING AND QUALITY OF LIFE DIMENSION IN WATER RESOURCES PLANNING AND DEVELOPMENT.
Utah State Univ., Logan. Inst. for Social Science Research on Natural Resources.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-250966, $7.75 in paper copy, $2.25 in microfiche. OWRT XX-125 (No. 3752) (1) Proceeding of the Conference of the University Council on Water Resources, July 10-12, 1973, Utah State University, Logan. 213 p. Andrews, W. H. , Burdge, R. J., Capener, H. R., Warner, W. K., Wilkinson, K. P.
Identifiers: *Social Well-Being, *Quality of Life Measurement, Social indicators(masurement).

These proceedings represent the final report from a conference which was directed toward problems of analysis and measurement of social well-being and quality of life with a focuus on water resources. Papers by academicians, deal with conceptualization, measurement and research results, response papers from representatives of government and private organizations. Sections of the report cover the background of development of social well-being as a relevant value in planning and evaluation of water resources; problems in the political process in adopting social indicators and problems of organizing for needed research of a national character with thinly scattered personnel; methodology and some results in research relating to social goals; quality of life and water resources; an overview of theoretical and conceptual issues; and finally a synthesis of these elements concerning possibilities and conditions related to dealing with social well-being as a functional account in planning and evaluating water resources development. (See W76-05355 thru W76-05370) (Andrews-Utah State).
W76-05354

THE GENESIS AND FUNCTION OF THE FOURTH WATER RESOURCES COUNCIL ACCOUNT,
Office of the Chief of Engineers (Army), Washington D. C. Civil Works Directorate.
W. J. Donovan.
The Social Well-being and Quality Life Dimension in Water Resources Planning and Development, Proceedings: Conference of University Council on Water Resources, July 10-12, 1973, Utah State University, Logan. p 11-27, 1 fig, 28 ref.

Descriptors: *Welfare(Economics), *Social aspects, *Social function, *Environmental effects, Water resources, *Planning, Cost-benefit analysis, Indirect benefits, Direct benefits, Social impact, Population, *US Water Resources Council.
Identifiers: *Social welfare function, Bergson function, Social well-being, 'Fourth Account' objectives, National Environmental Policy Act of 1969, River and Harbor and Flood Control Act of 1970, Public participation, Community growth, Community cohesion.

Today water resource planners must consider many more objectives and potential impacts than formerly because of increased public concern for social and environmental effects and increased public participation. Government laws, such as the National Environmental Policy Act of 1969, Sections 122 and 209 of the River and Harbor and Flood Control Act (RH & FC Act) of 1970 and the Principles and Standards of the Water Resources Council, have also affected planners' efforts. In response to this broadening of objectives, to include the 'fourth account' which is defined to include the social well-being and quality of life dimension, evaluating procedures have also broadened. Evaluation must view economic, social and environmental effects. Multidisciplinary skills are called for and the traditional economic framework is no longer adequate. There is a need for a social welfare function in the Bergson tradition which encompasses the full range of society's economic and non-economic preferences, but this cannot be constructed at present. Best alternative is an open planning process which seeks the fullest public involvement as the RH & FC Act mandates the Corps of Engineers to do. There must be attention to non-monetary considerations and a balance of beneficial and adverse project effects, both direct and indirect. Social effects that can result from a proposed project are: income distribution, population density and mobility, displacement of people, desirable community growth, public health, community cohesion, certain cultural and recreation alternatives, and environmental effects. (See also W76-05354) (Smith - North Carolina)
W76-05355

GOVERNMENT AGENCY EFFORTS IN QUALITY OF LIFE IMPACTS,
Cornell Univ., Ithaca, N.Y. Water Resources and Marine Sciences Center.
D. J. Allee.
In: The Social Well-being and Quality of Life Dimension in Water Resources Planning and Development. Proceedings: Conference of University Council on Water Resources, July 10-12, 1973, Utah State University, Logan. p 28-38, 12 ref.

Descriptors: *Cost-benefit analysis, *Economics, Water resources, *Planning, *Social aspects, Evaluation, *Income distribution, Federal government, Environmental effects, Welfare(Economics), U S Water Resources Council.
Identifiers: *Social well-being, *Public participation, *Multiple objective evaluation, Citizen participation, Government agency.

In public water resource investment the local identity of projects has been taken into account in decision making. Formerly, technical feasibility, cost-benefit analysis, and sustained local support have been tests to accept or reject projects. Today environmentalists have struck a blow at local support, and given a choice of other federal assistance projects; water development does not always get first priority from citizens. Multiple objective evaluation may possibly loosen old procedures and ways of handling information. A new version of multiple objective evaluation published in the Federal Register in December 1971 downgrades the concept of social well-being from an objective against which to formulate projects to an evaluation account which includes the following factors: income redistribution, health and safety, emergency preparedness, and other relevant social effects. Issuance of the Water Resources Council Principles (the Blue Book) spurred efforts at planning toward and evaluating social well-being factors. Now economics is the dominant framework for analysis. Economists tend to be the key evaluators of efficiency and distribution. In testing 19 programs only one team of evaluators attempted to formulate a new plan or project against the social well-being objective. Functional program output was seen as justification for the project by most test teams. Income redistribution can be handled quantitatively by identifying benefit incidence by affected groups and by income classes within groups and through evaluating cost incidence which should be a blend of negative project effects

and tax and payment distribution. A simple test is whether or not there is a net progressive effect of the project. (See also W76-05354) (Smith-North Carolina)
W76-05356

THE ROLE OF SOCIAL SCIENTISTS IN THE DETERMINATION OF THE SOCIAL WELL-BEING AND QUALITY OF LIFE DIMENSION IN WATER RESOURCES,
League of Women Voters, Washington, D.C.
R. C. Clusen.
In: The Social Well-being and Quality of Life Dimension in Water Resources Planning and Development. Proceedings: Conference of University Council on Water Resources, July 10-12, 1973, Utah State University, Logan. p 39-43.

Descriptors: *Social aspects, Water resources, *Planning, *Environmental effects, Evaluation, *Alternative planning, *Research priorities, Technology, Planning, Decision making, Social impact.
Identifiers: *Social well-being, *Public participation.

A primary role of social scientists should be in closing the gap between science and technology, and social, legal and political customs. Research into the social well-being dimension of water management should center on the criteria to be used for evaluating alternatives; the evaluation of needs, both economic and humanistic; the determination of public goals; and the manner in which the public can let choices be known. Planning must go beyond technical aspects as the value of more growth following old patterns is being questioned. There will continue to be increased public interest in changing the way the economy grows and the use made of that growth. The value of projects which overtly try to thwart natural processes is no longer clear. For example, instead of building a flood control reservoir it may be better to have adequate flood plain zoning. The taxpayer has no direct way through the political process of making his rational choices known. Citizens find it very difficult to weigh social and economic factors in water management. Collaboration between natural scientists, engineers and social scientists can provide a new kind of assessment of water management institutions. Determinations ought to be made as to just what is participation of the general public in planning and development. Projects and policies must be in harmony with the demands of the whole natural system, including the needs of people as individuals and as a group. (See also W76-05354) (Smith-North Carolina)
W76-05357

SOCIAL SCIENCE RESEARCH ON WATER RESOURCE ISSUES: PROBLEMS OF ORGANIZATION, ADMINISTRATION AND MANAGEMENT,
New York State Coll. of Agriculture and Life Sciences, Ithaca. Dept. of Rural Sociology.
H. R. Capener.
In: The Social Well-being and Quality of Life Dimension in Water Resources Planning and Development. Proceedings: Conference of University Council on Water Resources, July 10-12, 1973, Utah State University, Logan. p 46-52, 10 ref.

Descriptors: Water resources, *Planning, *Research priorities, *Social aspects, *Social values, Evaluation, Decision making, Grants.
Identifiers: *Quality of life, *Social science, Social well-being, 'Fourth Account' objectives, Research proposals.

Research on the social and quality of life dimensions of water resources cannot be done through today's independent small scale projects, but larger issues must be addressed in a more holistic sense so that isolated understandings can be put together. Today there is a paucity of funding for social research in water resources, paralleling the case of agricultural research where some 96% of funds in 1966 went to technological research and less than 5% went to social science research. This system is locked in to present approaches because of the training of administrators and scientists, because few social scientists have been involved in analysis, and because natural phenomena are easier to understand. Trying to change this system will involve structural organization changes which will be resisted by individuals and by established functional patterns of research. Items that demand research attention are: the meaning of the quality of life; methodologies to be employed; and the kind of individual and organizational changes that are needed for research to be oriented toward measuring quality of life components. Specifically, the following are needed: recruitment of social scientists to undertake research; organization of working conferences; facilitating grants from water resource agencies which could lay the foundation for progress in the early stages of research. Stages in the development of multidisciplinary research are: (1) problem exploration supported by funds for travel and working conferences; (2) completion of a project proposal to be submitted to peer review and administrative approval; (3) collection of data leading to a published document. (See also W76-05354) (Smith-North Carolina)
W76-05358

THE POLITICS OF INFORMATION: THE SOCIAL WELL-BEING OBJECTIVE,
Arizona Univ., Tucson. Dept. of Government.
H. Ingram.
In: The Social Well-being and Quality of Life Dimension in Water Resources Planning and Development. Proceedings: Conference of University Council on Water Resources. July 10-12, 1973, Utah State University, Logan. p 53-58, 12 ref.

Descriptors: Water resources, *Planning, *Social aspects, *Evaluation, *Social values, Decision-making, Cost-benefit analysis, U S Water Resources Council.
Identifiers: *Social indicators, *Social well-being, Information cost, Public participation.

While social indicators may be justified in terms of national goals or utility to social scientists, indicators will be used when their utility to policy-makers is greater than the cost of using them. Dollar costs or opportunity costs can be expensive unless such information is routinely collected and kept up to date. The costs of consuming the information can also be high if it is not well-ordered and concise. Also, there is a 'cost' involved in the use of information if it conflicts with the policy-makers own self-image or the image of the agency for which he works. Social indicators are foreign territory for agencies like the Office of Management and Budget which are thoroughly versed in cost-benefit analysis, and therefore likely to use these indicators. The utility of new information is important. Indicators can be used to justify actions which an agency is already determined to take or in some cases to make a project look respectable even though on economic grounds alone it may not be justifiable. A recent increase of 1 5/8% in the discount rate used by government means that some marginal projects are no longer supportable using economic criteria alone so that social evaluation may lead to a justification of these projects. Another value of social indicators is to provide support for projects in the face of increasing criticism from citizens of the social and environmental impacts of projects. (See also W76-05354) (Smith-North Carolina)
W76-05359

SOCIAL IMPACTS AND METHODOLOGICAL PERSPECTIVES FROM A POST AUDIT ANALYSIS OF WATER RESOURCE DEVELOPMENT,
Utah State Univ., Logan. Inst. for Social Science Research on Natural Resources.
W. H. Andrews, and G. E. Madsen.
In: The Social Well-being and Quality of Life Dimension in Water Resources Planning and Development. Proceedings: Conference of University Council on Water Resources, July 10-12, 1973, Utah State University, Logan. p 61-74, 2 fig, 8 tab, 15 ref. OWRT C-2192(No. 3408)(2).

Descriptors: *Direct benefits, *Indirect benefits, Water resources, *Planning, *Social impact, *Recreation demand, *Water demand, Projections, Reservoirs, Irrigation, Water supply, Cost-benefit analysis, Social aspects, Social values, Fishing, *Utah.
Identifiers: Weber Basin(UT), Pineview(UT), Willard Bay(UT), Ogden(UT), Rockport(UT), Lost Creek(UT), East Canyon(UT).

Research presented attempted to measure social impacts of a water reclamation project in Weber Basin which includes Ogden, Utah and surrounding areas. The reservoir project has potential impacts on welfare interest including the social values that motivate choices of behavior, aesthetic interest, and diversion-entertainment interests. Several methods were used to identify social impacts. In the 1949-59 planning period estimates of total project water supply changed from 285,000 to 212,000 acre-feet and overall estimates of irrigation requirements were lowered. The projected recreation cost allocations dropped from $4.6 million to $3.7 million but over the whole time period the benefit-cost ratio was always far greater than 1.0 for recreation. Actual consumption figures after the project was built were compared with planning projections. The 1972 irrigation water sales were 55% of the 1959 projection of available irrigation water; municipal water sales for 1972 were 78% of the 1959 estimate. In recreation use, 4 of the 5 reservoirs had more recreation visitor days of use than projected. In a projected random sample of urban dwellers there was a perceived increase in participation in all recreation activities associated with the use of reservoirs except for swimming which did not change significantly. Almost 80% of the respondents felt that a lack of water-related activities would detract from enjoyment of their life. In the future there may be a conflict between uses if increased selling of water results in a drawdown of reservoir water to levels unacceptable for recreation use. (See also W76-05354) (Smith-North Carolina)
W76-05360

A SUMMARY OF SOCIOLOGICAL STUDIES OF WATER RESOURCES DEALING WITH SOCIAL GOALS AND THE QUALITY OF LIFE: 'THE STRAWMAN' AND OTHER STUDIES,
Kentucky Agricultural Experiment Station, Lexington.
R. V. Burdge.
In: The Social Well-being and Quality of Life Dimension in Water Resources Planning and Development. Proceedings: Conference of University Council on Water Resources, July 10-12, 1973, Utah State University, Logan. p 75-88, 94 ref.

Descriptors: Water resources, Planning Social aspects, *Social impacts, Evaluation, *Income distribution, Decision making, Research priorities, Recreation.
Identifiers: *Social well-being, *Quality of life, *Strawman report.

Existing theories and methodologies must be used to understand the quality of life dimension of water resources development. Of the important social goals only 1/3 can be captured by economic indicators. Factors in the social well-being dimension are described. Studies of the TVA should indicate how goals can be kept from being distorted bureaucratization. Studies on attitudes show that the quality of life is enhanced where people perceive personal benefits. Middle class people are more likely to see recreational benefits than groups such as farmers and rural inhabitants. People who favor change are younger, better edu-

cated, have higher incomes and hold modern values, while those who oppose are long-term residents, land owners, farmers and rural people. Relocation and resettlement costs tend to be higher for larger families, older persons, long term residents, and those without knowledge of legal apparatus who often accepted settlement below fair market value of their property. Research is needed on how forced migrants might be treated to improve their quality of life. Willingness to participate in water projects is based on need, community awareness, knowledge, expectations of personal benefits, and higher socioeconomic status. Water based recreation enhances the quality of life mostly for young lirbam families. The Strawman report proposes primary goals, subgoals and social indicators to be used with undefined 'connectors' in determining how one course of action affects these goals and subgoals. The report was criticized as being too aggregate and untested. (See also W76-05354) (Smith-North Carolina)
W76-05361

METHODOLOGICAL STRATEGIES FOR EVALUATING THE EFFECT OF WATER RESOURCES ON SOCIAL WELL-BEING AND QUALITY OF LIFE,
Wisconsin Univ., Madison. Dept. of Rural Sociology.
For primary bibliographic entry see Field 6A.
W76-05362

TOWARD A QUANTITATIVE MEASURE OF THE QUALITY OF LIFE,
Michigan State Univ., East Lansing. Dept. of Sociology.
For primary bibliographic entry see Field 6A.
W76-05363

THE RELATIONSHIP BETWEEN SOCIAL PSYCHOLOGICAL SYSTEMS AND WATER RESOURCES DEVELOPMENT: A SUMMARY,
Abt Associates, Inc., Cambridge, Mass.
S. J. Fitzsimmons, and O. Salama.
In: The Social Well-being and Quality of Life Dimension in Water Resources Planning and Development. Proceedings: Conference of University Council on Water Resources, July 10-12, 1973. Utah State University, Logan. p 117-158, 16 tab, 28 ref.

Descriptors: Water resources, *Social impact, *Water resources development, *Social needs, *Analytical techniques, Social aspects, Cost-benefit analysis, Evaluation, Environmental effects, Decision-making, Benefits, Costs, *Planning, *Social values.
Identifiers: *Multiple-objective planning, *Quality of life, Group measures, Social psychological systems.

The aim of this study, built upon existing theories of the social sciences and water development, was to construct a statement of man's social need for water and the impact of water upon man, and to develop measures to assess alternative water development activities. Concepts from the social sciences which were relevant to water policy were put into 7 categories, including individual and group behaviors, social processes, and population, to form a hierarchy for further study of man/water relationships. Water development activities and functions were identified and grouped into 14 functional categories. A matrix was constructed to identify various interactions between man and water. Each of the 98 matrix cells was examined for parameters concerning man's needs for water and positive and negative benefits of water. For example, the cell at the intersection of the social category 'group' and the water function 'security' revealed parameters including perception of a threat from water origin to the group members, perception of such a threat to the group's goals, and so on. These parameters are not measures but provide insight. Measures should be capable of being aggregated to larger geographic areas, reflect concerns which can be compared to economic and environmental concerns, and reflect concern for equity and quality of life. In the context of multiple-objective planning the measures should provide useful information for decision-making, lead to an optimal choice, reflect concern for long-range planning, and build upon existing models. The next step should be data collection and development of a logic for ranking of alternative projects for an area, followed by field tests and specification of an aggregation model. (See also W76-05354) (Smith-North Carolina)
W76-05364

SOCIOLOGICAL CONCEPTS OF SOCIAL WELL-BEING: FRAMEWORKS FOR EVALUATION OF WATER RESOURCES PROJECTS,
Pennsylvania State Univ., University Park. Dept. of Rural Sociology.
K. P. Wilkinson.
In: The Social Well-Being and Quality of Life Dimension in Water Resources Planning and Development. Preceedings: Conference of University Council on Water Resources, July 10-12, 1973, Utah State University, Logan. p 160-170, 25 ref.

Descriptors: Water resources, *Planning, *Social aspects, *Evaluation, *Social change, *Research priorities, *Social needs, Environmental effects, Decision making.
Identifiers: Social theories, *Social well-being, Social conditions, Quality of life, Equilibrium theory, Field theory.

To undertake purposive social action a clear framework of projected end states or goals is needed. Three steps are discussed: (1) The concept of social well-being must be distinguished from a concept of individual well-being and one of universal, ecological well-being, as these are variants of the same reality. Individual well-being is necessary for social well-being but the individual's experiences are only indirectly affected by social planning. Collective action must create humane institutional structures within which the individual is free to experience his distinctive human and private capacities, and thus actualize the quality of life. Conditions which would facilitate a transition from a dominant concern with economic growth to a more balanced human oriented approach include distributive justice, openness of communication, tolerance, interpersonal communication and collective viability. (2) Theories of social change range from equilibrium theories which view social change as a sequence of steps toward an ever more adequate adjustment of man and society with universal principles of orderly, holistic arrangement, to field theories which emphasize novel, emergent aspects of life. Social well-being is amenable to analysis using either theory or other modern theories. With equilibrium theory actions would be judged on how they increase functional integration or balance among system levels. Field theory evaluates the degree to which goals of actors are effectively pursued within the general framework of the conception of individual, social and ecological needs. (3) Water resources research can help to establish a useful understanding of the change process. (See also W76-05354) (Smith-North Carolina)
W76-05365

SOME PROBLEMS IN MEASURING THE SOCIAL CONSEQUENCES OF LARGE-SCALE DEVELOPMENT PROJECTS,
Brigham Young Univ., Provo, Utah. Dept. of Sociology.
W. K. Warner.
In: The Social Well-being and Quality of Life Dimension in Water Resources Planning and Development. Proceedings: Conference of University Council on Water Resources, July 10-12, 1973, Utah State University, Logan. p 171-185, 1 fig, 19 ref.

Descriptors: Water resources, *Evaluation, *Social impact, Analysis, *Model studies, Indirect benefits, Direct benefits, Decision making, Methodology, *Planning.
Identifiers: *Research models, *Social well-being, Goal models, General effects model.

The degree to which social consequences of large-scale development projects can be measured depends on the purposes of the users of evaluations and on the perspectives of those who judge the quality of information. To be of use to policy makers, social scientists should work not only toward measurement of many variables, but also on creating packages of variables which have internal consistency and continuity. Which phenomena are to be measured is important. Three models are pertinent. (1) A Goal Model tries to evaluate the degree to which goals were successfully met by projects with the assumption that planning is goal-oriented, (an item which is questioned). This model may not have a broad enough scope to include all consequences. (2) The General Effects Model attempts to see if some segment of society has changed as a result of projects. It is questionable, however, if all relevant variables can be measured and identified. (3) A Combined Model is suggested and has 3 categories of dependent variables: (a) There must be a study of goals that were used in project planning and implementation since inclusion of some goals and not others implies the inclusion of some people as interested parties and not others; (b) The changes or effects represented by the attainment of the goals stated in the project design, including who benefits most and least, must be studied; and (3) Latent functions must be viewed to discover effects that were not anticipated. Several requirements must be met: an analysis of who benefits and who pays; adequate data base; adequate time span; accumulation and refinement of data and persuasive examples; and persuasive evidence supporting any attributions of cause. (See also W76-05354) (Smith-North Carolina)
W76-05366

SOME COMMENTS ON RURAL DEVELOPMENT MODELS AND CONCEPTS,
Wisconsin Univ., Madison. Dept. of Rural Sociology.
G. F. Summers.
In: The Social Well-being and Quality of Life Dimension in Water Resources Planning and Development. Proceedings: Conference of University Council on Water Resources, July 10-12, 1973, Utah State University, Logan. p 186-188, 5 ref.

Descriptors: *Water resources development, *Social impacts, Evaluation, *Rural sociology, Social aspects, *Research priorities, Analysis.
Identifiers: Case studies, *Quality of life, *Social well-being, Distributional analysis, Industrial development.

The paper given by K.P. Wilkinson, 'Sociological Concepts of Social Well-being: Frameworks for Evaluation of Water Resources Projects' (see W76-05365) is criticized. It is ultimately individual well-being that is the concern; ecological, social, or economic well-being is of interest only because it is believed that those systems have a conditioning effect on individual well-being. Efforts to develop a scientific theory of quality of life are going to fail. However, there are possible roles for scientists in relation to rural developments: (1) As a facilitator, the scientist may identify efficient means for achieving stated goals; (2) As an evaluator he may assess the effectiveness of programs; (3) As a bookkeeper it is possible to collect data on relevant parameters; and (4) The scientist may define norms based on alternative policy goals and related means. Only when we separate domains of life, plant, animal, human and subclasses of each, can quality of life be confronted. Case studies are valuable but of limited utility because they assume that effects are localized. Effects are extended by

rural commuter fields. It is necessary to better define target populations with special attention given to the differentiated and pluralistic nature of people affected by development projects, and to narrowly focus studies. These should be viewed as field experiments rather than general systems monitoring projects. (See also W76-05354) (Smith-North Carolina)
W76-05367

SOCIAL WELL-BEING: PROBLEMS AND PROSPECTS,
Oregon State Univ., Corvallis. Dept. of Anthropology.
C. L. Smith.
In: The Social Well-being and Quality of Life Dimension in Water Resources Planning and Development. Proceedings: Conference of University Council on Water Resources, July 10-12, 1973, Utah State University, Logan. p 190-198, 3 fig, 1 tab, 38 ref.

Descriptors: Water resources, *Planning, *Social impacts, *Evaluation, *Decision making, Income distribution, Environmental effects, Research priorities, Standards, Columbia River.
Identifiers: *Columbia River Basin, *Social well-being, Case studies, Water quality management.

A systematic analysis of social well-being is difficult because such analysis cannot be both logically consistent and complete. There are multiple accounts (national income, distribution, etc.) and only one can be maximized at any one time. It is possible to choose not to deal with social well-being because there exists major policy questions, because there is not necessarily a correlation between quality of life and happiness, and because of the massiveness of the necessary data and its interdependent nature. However, the task should be undertaken and should not be put off in hopes of a breakthrough in the field. More responsibility should be given to social scientists so that their research would have more impact. In planning for the Columbia Basin Project in 1941 many of the social well-being questions were asked but answers had little resemblance to the prepared planning documents. A plausible approach to social well-being which mixes available knowledge with trial and error is to follow the model of water quality management. Managers have not known all factors which go into water quality; they had to deal with a great number of waste dischargers, and were inadequately funded. However minimum standards were arrived at and the worst offenders were attacked first. A similar approach to social well-being is possible in that some minimum standards do exist in nutrition, education, health, and housing. The population could be measured against these standards, those below standards identified and action programs undertaken. However, where programs have been undertaken in these areas, results have been less than impressive. (See also W76-05354) (Smith-North Carolina)
W76-05368

SOCIAL SCIENTISTS AND THE QUALITY OF LIFE: A CRITICAL SYNTHESIS,
Michigan State Univ., East Lansing. Dept. of Sociology.
D. E. Morrison.
In: The Social Well-being and Quality of Life Dimension in Water Resources Planning and Development. Proceedings: Conference of University Council on Water Resources, July 10-12, 1973, Utah State University, Logan. p 199-203, 1 fig, 1 tab.

Descriptors: *Social impact, *Decision making, *Institutions, *Social needs, Water resources, Planning, Evaluation, Alternative planning, Research priorities, Social values, Social aspects.
Identifiers: *Social well-being, *Quality of life.

This paper deals with 3 problem areas. (1) The basic elements of the concept of the Quality of Life (QOL) must be the focus of study because of disagreement about more esoteric elements. In the United States, where QOL is quite high, there is no commitment to impose a definition of QOL on the public. This should be avoided because it would soon reach diminishing returns. In effect, freedom ranks above basic needs so that to provide for the general welfare must involve only the necessary, but not sufficient, conditions for freedom, allowing for mobility between quality levels. It does not follow that because basic needs are met a person is happy, as social institutions also have an impact. Efforts should be made to understand the relationship between institutions and basic individual needs. (2) Methodological problems in QOL research are difficult, but not insoluble. Water resources is the ultimate independent variable here and it is the effects on institutional arrangements which in turn affect aggregated individual needs which is important. Water resource decisions must be viewed in the regional and national context, but these resources are only one element among many resources which contribute to QOL. (3) The QOL issue is politically complex and balancing of various groups' needs is not easy. Needs of less articulate groups must be considered as their basic needs are important. The QOL issue should not be used merely to support existing programs or methods. (See also W76-05354) (Smith-North Carolina)
W76-05369

SOCIAL WELL-BEING AND QUALITY OF LIFE: SCIENCE, POLITICS OR MOVEMENT.
Missouri Univ., Columbia.
D. Hobbs.
In: The Social Well-being and Quality of Life Dimension in Water Resources Planning and Development. Proceedings: Conference of University Council on Water Resources, July 10-12, 1973, Utah State University, Logan. p 204-210, 9 ref.

Descriptors: *Social impact, *Decision making, *Evaluation, Social aspects, *Political aspects, Water resources, Planning, *Social participation.
Identifiers: Citizen participation, *Quality of life, *Social well-being, Social indicators, Sociologists.

Rather than assuming that society is an acceptable standard and that it can be improved by eliminating deviant behavior, concern about the system itself is increasing. Social well-being and quality of life (SWB/QL) is an important issue in which sociologists can take the option of identifying and measuring social indicators. A political definition of the problem is possible in which the process by which judgments are made and whose judgments are taken into account is viewed. Another option is to view SWB/QL as a social movement which challenges existing standards. Some assumptions shared by many at the conference are: SWB/QL is subjective and varies among individuals; water has multiple uses and is governed by many specialized agencies; the uses central to a given decision depend on particular groups which initiate actions and their relative power; and sociology can be useful in conceptualizing and measuring SWB/QL, and dealing with organization questions. Many of these concerns support the view that SWB/QL is a political problem and involves several types of political units: localities, users, indirectly affected potential users, politicians and agency personnel. Water resource planning and decision-making can benefit from increased participation by publics and interests covering a wide area of concern. The use of SWB/QL includes improved descriptive reporting, analysis of social change and prediction of future social events, but it is argued that the setting of goals, the evaluation of programs and the development of a balance sheet are impossible uses of social indicators. Finally, it is necessary that both technical and political problems of SWB/QL be studies. (See also W76-05354) (Smith-North Carolina)
W76-05370

PUBLIC PARTICIPATION IN WATER AND WASTE WATER PLANNING,
Clemson Univ., S. C. Dept. of Environmental Systems Engineering.
B. C. Dysart, III.
Presented at the Southeastern Conference on Water Supply and Waste water in Coastal Areas, Wrightsville Beach, N. C. April 2-4 1975. 33 p, 21 ref.

Descriptors: *Planning, *Alternative planning, *Decision making, *Social aspects, *Public benefits, Coastal areas, *Governments, Project planning, Legislation, Water supply development.
Identifiers: *Public participation.

Public participation is necessary to have water supply and waste water systems responsive to public needs. This paper defines differing concepts, discusses their effectiveness and suggests some approaches applicable to water supply and wastewater treatment projects. The three components of a public participation program include a communication method, an interaction method for planner and public, and an iterative mechanism for experts and public to review recommendations after revisions have been made. Participation and authorization levels ranging from non-participation to citizen power are outlined. Public participants must understand the trade-offs, their environmental cause and effect relationships, and incurred costs. Planners' responsibilities include obtaining reactions to alternatives, assessing feedback from discussions and feasibility of alternatives, and determining reaction to final plan. Factors necessary in developing a public participation program include determination of interest groups, participants, medium, form of output and the organization of the group. A review of public participation approaches and attitudes of government agencies was made. (Salzman - North Carolina)
W76-05371

A METHOD FOR APPLYING RESEARCH TO ENVIRONMENTAL PLANNING AND MANAGEMENT: A CASE STUDY OF ISSUES IMPORTANT TO THE CHESAPEAKE BAY REGION,
Center for the Environment and Man, Inc., Hartford, Conn.
R. H. Ellis, P. B. Cheney, and D. R. Zoellner.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-227 719, $5.00 in paper copy, $2.25 in microfiche. Report No. NSF-RA-E-73-009, May 1973. 87 p, 7 fig, 13 tab, 54 ref. GI 35358.

Descriptors: *Regional development, *Planning, *Methodology, *Management, *Chesapeake Bay, Environment, Coasts, Decision making, Data collections, Research priorities.
Identifiers: *Research projects, Case study.

An eight step procedure is discussed for identifying key issues and problems as they relate to management functions and activities, and for identifying and selecting research projects to support the management functions related to the tidal limits of Chesapeake Bay region but applicable to other geographic areas. The steps are: (1) Identify uses of a region; (2) rank uses by importance of associated planning and management issues; (3) identify and classify types of problems; (4) rank and select important problems; (5) evaluate problems; (6) relate problems to management functions and activities; (7) relate research and information needs to management functions and problems, and, (8) establish research project priorities, sequence, and approaches. The types of problems specifically considered in the Chesapeake Bay region were recreational uses, commercial fishing, commercial marine transportation, shoreland use--industrial/commercial/residential development, mineral resources, waste disposal, wetlands for natural production, and water supply. The problems of meeting each specific need are classified on socio-economic

natural, technological, and institutional aspects, and their conflicting interrelated uses. (Auen-Wisconsin)
W76-05434

USER PREFERENCES OF POLICY ALTERNATIVES: THE CASE OF RECREATIONAL USER ATTITUDES TOWARD DEVELOPMENT AND REGULATION AT LAKE MONROE, INDIANA,
Indiana Univ., Bloomington. Poplars Research and Conference Center.
C. Wise.
Occasional Papers No. 4, January 1975. 97 p, 27 tab, 7 ref, 3 append.

Descriptors: *Recreation, *Administrative decisions, *Attitudes, *Surveys, *Regulation, Methodology, Law enforcement, Reservoirs, *Indiana, Environment, Recreation facilities, Water quality.
Identifiers: *Lake Monroe(Ind).

Opinions of recreational users of Lake Monroe Reservoir, Indiana, were surveyed concerning additional development of various facilities, recreational activity regulations, environmental quality, and their perception of the extent of enforcement of recreational regulations. Preferences toward additional development varied widely. There was a lack of relationship between county of residence and facilities preference, and between perception of environmental condition (water clarity, shore erosion, forest attractiveness, and litter) and facilities. Only banning of motorcycling received significant support. Bicycling, boat fishing, and sailing received majority support. Motor boating, camping, horseback riding, swimming, waterskiing, and motorcycling received a plurality support in certain areas. Since no substantial relationships were found between recreational activity preference and opinion on recreational activity regulation, policy decisions made to restrict activities in certain areas will not meet opposition on purely recreational activity lines, but situational variables could alter this condition. County of residence and frequency of visits were not significantly related to recreational restrictions. A substantial number of respondents thought that there were problems with shoreline erosion, water clarity, and litter as related to environmental quality. The survey methodology was based on primary variables as related to preferred recreational activity, road development, regulation of activities and their enforcement, environmental quality, and frequency of use. (Buchanan-Davidson--Wisconsin)
W76-05435

GUIDE TO THE COSTING OF WATER FROM NUCLEAR DESALINATION PLANTS,
Applied Research and Engineering Ltd., Durham (England).
For primary bibliographic entry see Field 3A.
W76-05436

A STUDY OF HOW WATER QUALITY FACTORS CAN BE INCORPORATED INTO WATER SUPPLY ANALYSIS.
Ernst and Ernst, Washington, D.C.
For primary bibliographic entry see Field 5G.
W76-05440

AN ANALYSIS OF WATER RESOURCE BENEFIT DETERMINATION METHODS WITH SPECIAL REFERENCE TO THE COSUMNES RIVER DIVISION PROJECT,
California Univ., Davis. Dept. of Agricultural Economics.
R. F. Tratz, G. W. Dean, and H. O. Carter.
Available from the National Technical Information Service, Springfield Va 22161, $6.00 in paper copy, $2.25 in microfiche. Interim report, June1973. 148 p 24 tab 115 ref 8 append 14-06-200-5075.

Descriptors: *Benefits, *Estimating, *Input-output analysis, *Water resources development, *Model studies, Cost-benefit analysis, Income, Multiple-purpose projects, Regional development, Employment, Regional economics, Water demand, Water supply, Project purpose, Measurement, *California.
Identifiers: *Cosumnes River Project(Calif), Multiplier effects.

A theoretical input-output model which allows measurement of the magnitude of net income and employment impacts of a multipurpose regional water resources development project is constructed. Advantages of the model over the current methods of determining benefits include: (a) providing a range of regional income benefits, (b) allowing estimates of the direct and indirect output and multiplier effects of an initial investment in water facilities and permanent income and employment effects, (c) accounting for direct project impacts in the Cosumnes service area as well as indirect impacts expected to occur in the surrounding 4-county region, (d) allowing multisectoral analysis of local economics, (e) offering a more equal treatment of each project purpose, and, (f) bringing the direct effects of each project purpose into the model. Disadvantages include the possibility of some double-counting of benefits and the difficulty of distinguishing between direct or indirect benefits. Basing benefits on the value or demand for water rather than its cost, tradeoffs among competing uses, and possible environmental costs, are briefly considered. The model projects a regional income-benefit to 4-county regional cost ratio ranging from 1.78 to 4.59 in the case of the Cosumnes River Division Project, indicating that the technique can demonstrate the regional economic feasibility of this type of development project. (Luedtke-Wisconsin)
W76-05441

WATER USE IN SELECTED COMMERCIAL AND INSTITUTIONAL ESTABLISHMENTS IN THE BALTIMORE METROPOLITAN AREA,
American Society of Civil Engineers, New York.
For primary bibliographic entry see Field 6D.
W76-05452

MANAGEMENT OF WATER QUALITY THROUGH SELECTED INSTITUTIONS AND INSTRUMENTS,
Iowa State Univ., Ames. Dept. of Economics.
For primary bibliographic entry see Field 5G.
W76-05453

ECONOMICS OF URBAN WATER DEMAND: A CASE STUDY OF THE HONOLULU BOARD OF WATER SUPPLY,
Hawaii Univ., Honolulu. Dept. of Agricultural and Resource Economics.
For primary bibliographic entry see Field 6D.
W76-05455

FLOOD PROOFING DECISIONS UNDER UNCERTAINTY,
Massachusetts Univ., Amherst Dept. of Agricultural and Food Economics.
For primary bibliographic entry see Field 6F.
W76-05456

6C. Cost Allocation, Cost Sharing, Pricing/Repayment

A STUDY OF ALTERNATIVE METHODS TO MODERNIZE WATER INSTITUTIONS AND ELIMINATE PROBLEMS OF MULTIPLE JURISDICTION AND CONFLICTING OBJECTIVES,
Utah State Univ., Logan. Coll. of Engineering.
For primary bibliographic entry see Field 6E.
W76-05015

A CONTINUOUS REVIEW INVENTORY MODEL FOR IRRIGATION WATER APPLICATION,
Arizona Univ., Tucson. Dept. of Systems and Industrial Engineering.
For primary bibliographic entry see Field 3F.
W76-05019

BIG-METER TESTING PROGRAM BOOSTS WATER REVENUES.
Water and Sewage Works, Vol. 122, No. 12, p 36-37, December, 1975. 4 fig.

Descriptors: *Costs, *Water supply, *Industrial water, *Potable water, Chemical industry, Oil industry, Steel, Municipal water, Water consumption(Except connsumptive use), Water utilization, Treatment facilities, Economics, Measurement, *Instrumentation, *Testing, Indiana.
Identifiers: *Water meter testing, Revenue collection, East Chicago(INd).

When the East Chicago, Indiana, Water Department tested large water meters in the area, it was found that four out of seven meters were less than 75% accurate. Within the municipality, there are major plant facilities in steel mills, foundries, oil refineries, and chemical industries which use about 311 million gallons of potable water per month. In addition, the residential and commercial use of potable water is about 312 million gallons per month. By a spot check on the industrial large water meters it was determined that some meters were frozen while others were old and obsolete. In some cases a single register compound meter could be installed. Replcement of four meters led to a revenue increase of $16,000 per year. In addition to the revenue increase, the city has found a sharp decrease in the amount of unaccounted-for water usage. (Kramer-FIRL)
W76-05060

FINANCING AND MANAGEMENT OF THE PROPOSED SEWERAGE SCHEME FOR JAIPUR TOWN,
Jaipur Public Health Engineering Dept. (India). Planning Circle.
For primary bibliographic entry see Field 5D.
W76-05062

ECONOMIC CONSIDERATIONS FOR PLANNING SEWAGE SLUDGE DISPOSAL SYSTEMS,
Rutgers - The State Univ., New Brunswick, N.J. Dept. of Environmental Science.
For primary bibliographic entry see Field 5E.
W76-05083

THE ECONOMICS OF CLEAN WATER - 1973.
Environmental Protection Agency, Washington, D. C.
For primary bibliographic entry see Field 5G.
W76-05203

THE LARGE-SCALE REGIONAL PLANT HYPOTHESIS: DISCRIMINANT ANALYSIS,
Kentucky Univ., Lexington. Dept. of Economics.
For primary bibliographic entry see Field 5G.
W76-05267

DECOLORIZE KRAFT BLEACH PLANT EFFLUENTS EFFECTIVELY WITH LOW-COST POLYMERIC ADSORPTION METHOD,
Rohm and Haas Co., Philadelphia, Pa.
For primary bibliographic entry see Field 5D.
W76-05288

COST-EFFECTIVENESS ANALYSIS FOR WATER POLLUTION CONTROL,
National Environmental Research Center, Cincinnati, Ohio.
For primary bibliographic entry see Field 5D.

W76-05324

SOCIAL IMPACTS AND METHODOLOGICAL PERSPECTIVES FROM A POST AUDIT ANALYSIS OF WATER RESOURCE DEVELOPMENT,
Utah State Univ., Logan. Inst. for Social Science Research on Natural Resources.
For primary bibliographic entry see Field 6B.
W76-05360

GUIDE TO THE COSTING OF WATER FROM NUCLEAR DESALINATION PLANTS,
Applied Research and Engineering Ltd., Durham (England).
For primary bibliographic entry see Field 3A.
W76-05436

COST ALLOCATION FOR A REGIONAL POLLUTION TREATMENT SYSTEM,
Florida Univ., Gainesville, Dept. of Agricultural Economics.
For primary bibliographic entry see Field 5G.
W76-05442

ECONOMICS OF EXHAUSTIBLE RESOURCES: THE FISHERY,
New South Wales Univ., Kensington (Australia).
G. Waugh, and P. Calvo.
Economic Record, Vol. 50, No. 131, p. 423-429, 1974. 2 fig, 14 ref.

Descriptors: *Marine fisheries, *Fish management, *Optimization, Economics, Fish harvest, Discount rates, Costs, Animal growth, Return(Monetary), Biomass, Mortality, Theoretical analysis, Resource allocation.
Identifiers: Beverton-Holt model.

An integrated approach to the problems of fisheries which combines the economic and biological variables relevant to the industry is developed. Prior economic studies have neglected the optimum time at which to exploit the fish during their life span and the interaction between catch and natural mortality. The Beverton and Holt concept of an optimum size at which fish should be caught has several economic objections; costs and revenues are not considered, future yields are not discounted to allow for the cost of waiting, and the biological approach is static in that it indicates that each fishery year-class should be exploited at one point of time during its life span. The integrated approach suggests that it is best to exploit each year-class over several periods. There is no optimum time at which the fish should be caught, but rather an optimal time path. The extent of exploitation will depend upon the social rate of time preference, the rate of growth of the year-class, and the prevailing demand and cost conditions in the industry. Regulation or management should aim at limiting, but not preventing, the catch from each age group through licensing. (Luedtke-Wisconsin)
W76-05443

FISHERY DYNAMICS: A NORTH ATLANTIC COD FISHERY,
Lund Univ. (Sweden).
R. Hannesson.
Canadian Journal of Economics, Vol. 8, No. 2, p. 151-173, 1975. 7 fig, 5 tab, 20 ref.

Descriptors: *Fish harvest, *Optimization, *Marine fisheries, Commercial fishing, Fish management, Fishing, Costs, Model studies, Economic efficiency.
Identifiers: Beverton-Holt model, Periodic fishing, Discounting, *Cod.

The optimal harvesting of a single fish group is discussed on the assumption that a unit of fishing effort removes a constant proportion of the fish stock. Discounting is shown to imply a longer fishing season. The relative merits of periodic and sustained fishing of a stock consisting of several groups are evaluated by simulating a Beverton-Holt model of a cod fishery. The impact of cost, discounting and natural fluctuations on the time-pattern of fishing is also discussed, as well as the practicability of periodic fishing. It is concluded that periodic fishing might be preferable for both small and large fisheries. A constant output might be achieved in the case of a large fishery by harvesting different stocks on a rotating basis. Periodic fishing could be practiced by a highly mobile fleet able to take maximum advantage of the natural fluctuations in stock size. A small fishery might find it advantageous to vary the fishing effort allocated to the cod fishery, depending on such things as the price of cod and the abundance of other fisheries. This periodic approach will allow the stock to replenish itself, thereby improving future prospects in that fishery. (Luedtke-Wisconsin)
W76-05445

INTERNATIONAL EXTERNALITIES AND OPTIMAL TAX STRUCTURES,
University of Western Ontario, London.
For primary bibliographic entry see Field 5G.
W76-05446

6D. Water Demand

RAIN DANCE DOESN'T WORK HERE ANYMORE, OR WATER USE AND CITIZEN ATTITUDES TOWARDS WATER USE IN ALBUQUERQUE, NEW MEXICO,
New Mexico Univ., Albuquerque. Div. of Governmental Research.
For primary bibliographic entry see Field 6B.
W76-05016

RURAL RESIDENTIAL WATER DEMAND IN KENTUCKY: AN ECONOMETRIC AND SIMULATION ANALYSIS,
Kentucky Water Resources Research Inst., Lexington.
O. C. Grunewald, C. T. Haan, D. L. Debertin, and D. I. Carey.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-250 752, $5.00 in paper copy, $2.25 in microfiche. Research Report No. 88, December 1975. 75 p, 13 fig, 7 tab, 37 ref. OWRT A-052-KY(1), 14-31-0001-4017, 14-31-0001-5017.

Descriptors: *Water demand, Elasticity of demand, Water management(Applied), Model studies, *Kentucky, *Simulation analysis, Income, *Econometrics, Rural areas, Water supply, Prices, Reservoirs, *Pricing, Regression analysis, Water utilization, Model studies.
Identifiers: Residences, *Rural residential water demand.

This study proposed that demand management through pricing policies can be used in conjunction with supply management to solve water supply problems in Kentucky. Economic principles were shown to apply to rural residential water use. From the economic model, a hyperbolic demand function was theorized. The mathematical form of this function used quantity of water as a function of price, income, value of residence, evaporation, and persons per residence. This function was estimated using ordinary least squares regression. A log-linear model was found to be a satisfactory representation of the demand function. Price was the only independent variable which was significant and had an elasticity of (-.92). As an application of pricing to demand management, the estimated regression equation was used in a simulation analysis. The simulation was used to determine the reservoir capacity necessary to supply the needs of 4,000 households given three different price levels for water. Reservoir size was determined by simulating reservoir size as a function of outflow as estimated from the demand function plus an assumed low flow rate and inflow from the Thomas-Fiering Model. This technique illustrated that price does affect the quantity of water demand which in turn effects reservoir capacity requirements. (Huffsey-Kentucky)
W76-05252

THE ECONOMIC VALUE OF WATER FOR SELECTED USES IN SOUTHWESTERN NORTH DAKOTA,
North Dakota Water Resources Research Inst., Fargo.
For primary bibliographic entry see Field 6B.
W76-05350

HOUSEHOLD WATER USE,
American Society of Civil Engineers, New York.
M. B. McPherson.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-250879, $5.50 in paper copy, $2.25 in microfiche. OWRT C-5045 (No. 4224) (5) American Society of Civil Engineers, Urban Water Resources Research Program, Technical Memorandum No. 28, January, 1976. 110 p, 1 fig, 2 tab, 87 ref, Append.

Descriptors: *Water demand, *Domestic water, *On-site data collections, *Municipal wastes, *Water reuse, Water conservation, Regression analysis, Cost-benefit analysis, Forecasting, Public health, Seasonal, *Water utilization, Demand, Water policy, Water quality.
Identifiers: *Household water use, *Water use variations.

Primarily addressed to researchers, this report on household water use presents definitions of: the statusof information; changes in public policies and goals; and consequent needs for new information and research. Discussed are some of the more important quality quantity and economic considerations. Demand variations are given predominant attention, for individual and multiple households. Reuse considerations are highlighted. An appendix contains a listing of a unique set of water-use data for nine individual households covering a two-week period at a one-minute recording interval.
W76-05353

A STUDY OF HOW WATER QUALITY FACTORS CAN BE INCORPORATED INTO WATER SUPPLY ANALYSIS.
Ernst and Ernst, Washington, D.C.
For primary bibliographic entry see Field 5G.
W76-05440

WATER USE IN SELECTED COMMERCIAL AND INSTITUTIONAL ESTABLISHMENTS IN THE BALTIMORE METROPOLITAN AREA,
American Society of Civil Engineers, New York.
J. B. Wolff, F. P. Linaweaver, Jr, and J. C. Geyer.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-250 998, $4.50 in paper copy, $2.25 in microfiche. Urban Water Resources Research Program, Technical Memorandum No. 27, December, 1975. 67 p, 13 fig, 24 tab, 41 ref. OWRT C-5045(No. 4224)(4).

Descriptors: *Water demand, *Municipal water, *On-site data collections, *Design criteria, Forecasting, *Water utilization, Institutions, *Maryland, Cities, Industries.
Identifiers: *Commercial water use, *Baltimore(Md), *Institutional water use, Peak water use.

Distributed originally in 1966, this report has been widely used as one of the few sources of field measurements of water demands of commercial and institutional establishments. Reissuance was predicated on the scarcity of original copies. Infor-

mation reported can be useful in at least the design of new water demand research endeavors. The Commercial Water Use Research Project spanned a period of 2-1/2-years, and was related to the much larger Residential Water Use Project. A substantial amount of new data was obtained in the Baltimore metropolitan area during the course of the Project. Twenty-nine separate commercial and institutional installations were monitored; and new design criteria were developed for a total of nine separate types of institutional establishments and sixteen separate types of commercial establishments. (McPherson-ASCE)
W76-05452

ECONOMICS OF URBAN WATER DEMAND: A CASE STUDY OF THE HONOLULU BOARD OF WATER SUPPLY,
Hawaii Univ., Honolulu. Dept. of Agricultural and Resource Economics.
H-S. Oh.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-251 036, $6.75 in paper copy, $2.25 in microfiche. PhD thesis, December 1973. 160 p, 10 fig, 13 tab, 64 ref, 17 append. OWRT A-030-HI (2).

Descriptors: *Hawaii, *Municipal water, *Water demand, *Water supply, Water utilization, Water costs, *Consumptive use, Water rates, Forecasting, Peak loads, Groundwater resources, Water resources development, Industrial water, Prices, Institutional constraints, Lawns, Use rates, Planning, Water allocation(Policy), Water policy, Regression analysis, Hydrogeology.
Identifiers: *Honolulu(Hawaii), Per capita consumption.

Water demand patterns and trends in Honolulu were studied. From 1960-1971 average daily per capita water consumption increased about 27%. Per capita consumption figures varied widely and showed different growth rates particularly in increased summer usage. Consumption was greater in single than in multiple family dwellings, due to more outdoor sprinkling. Consumption levels remained essentially constant over time in established residential areas. Overall increases in per capita consumption resulted from water use for other than indoor domestic purposes. Water consumption expanded with construction activity. Per capita water consumption data were fitted by linear regression to value of construction completed and annual rainfall changes; this equation explained 96% of total per capita consumption variations. Residential and commercial water users were not responsive to price increases, but large industrial users were. There was a relationship between price responsiveness to industrial demand and alternative water supplies. Nonexistence of price responsiveness in commercial demand may be associated with the structure of water bill payments. The water requirement approach is a practical method of forecasting future water needs. Peak load pricing may effectively reduce inequitable water supply cost distribution. Unified groundwater resource management is suggested. (Buchanan-Davidson--Wisconsin)
W76-05455

6E. Water Law and Institutions

FEASIBILITY OF REGIONAL UTILITIES FOR MANAGEMENT OF INDUSTRIAL AND MUNICIPAL WASTES,
Michigan Dept. of Commerce, Lansing. Office of Economic Expansion.
For primary bibliographic entry see Field 5G.
W76-05003

A STUDY OF ALTERNATIVE METHODS TO MODERNIZE WATER INSTITUTIONS AND ELIMINATE PROBLEMS OF MULTIPLE JURISDICTION AND CONFLICTING OBJECTIVES,
Utah State Univ., Logan. Coll. of Engineering.
F. W. Haws.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-250 116, $4.50 in paper copy, $2.25 in microfiche. Utah Water Research Laboratory Publication PRWG122-1, September 1975. 51 p, 8 ref, append. OWRT B-082-UTAH(1). 14-31-0001-3943.

Descriptors: *Institutions, *Institutional constraints, Organizations, Governments, Cities, Irrigation districts, Water districts, Water policy, Utilities, *Utah, Jurisdiction, State governments, Income, Profit, Taxes, Alternative costs.
Identifiers: Water conservancy districts, Mutual irrigation companies.

The water organizations in the State of Utah are non-businesses; most are governmental in nature, receiving revenues from taxes and expending their funds from a budget allocated out of such revenue. These organizations are, following the pattern of similar organizations, non-creative, non-innovative and in many cases are inefficient and ineffective in meeting optimum social needs. To alleviate this situation action should be taken to: (1) Amend the Utah Constitution by repealing Section 6 Article XI to allow municipalities the same option as other water users, to dispose of through sale or lease its water rights and associated physical works. This does not release a municipality from the responsibility to protect its citizens from fire danger or to provide its citizens with drinking water. (2) Repeal the Water Conservancy District Act, Chapter 9 Section 73 Utah Code Annotated 1953. The alliance that exists between the water conservancy districts and the Bureau of Reclamation is diverting public resources into expensive and unnecessary projects and leading to complete domination and control of water resources by the federal government. (3) The water conservancy districts should be disincorporated by devising some method of disposing of the repayment contracts with the federal government. (4) Reestablish the water privilege concept and eliminate water rights. (5) Remove water utilities from control of the Public Service Commission. (6) Allow and encourage the formation of free market controlled water utilities.
W76-05015

A GUIDE TO THE INTERSTATE CARRIER WATER SUPPLY CERTIFICATION PROGRAM.
Environmental Protection Agency, Washington, D. C. Div. of Water Supply.
For primary bibliographic entry see Field 5G.
W76-05040

CONTROLLING WATER POLLUTION,
World Health Organization, Geneva (Switzerland). Control of Environmental Pollution and Hazards.
For primary bibliographic entry see Field 5G.
W76-05061

USE OF ENVIRONMENTAL ANALYSES ON WASTEWATER FACILITIES BY LOCAL GOVERNMENT,
Teknekron, Inc., Washington, D.C. Applied Research Div.
For primary bibliographic entry see Field 5D.
W76-05072

CONTROL OF OIL AND OTHER HAZARDOUS MATERIALS,
Environmental Protection Agency, Cincinnati, Ohio. Office of Water Program Operations.
For primary bibliographic entry see Field 5G.
W76-05073

MUNICIPAL WASTEWATER TREATMENT WORKS CONSTRUCTION GRANTS, REFERENCES, REGULATIONS, GUIDANCE, PROCEDURES.
Environmental Protection Agency, Washington, D.C. Office of Water Program Operations.
For primary bibliographic entry see Field 5D.
W76-05075

A LIVESTOCKMAN'S GUIDE TO POLLUTION LAWS,
For primary bibliographic entry see Field 5G.
W76-05171

LEGAL IMPLICATIONS OF FEEDLOT POLLUTION IN NEBRASKA,
Nebraska Univ., Lincoln. Coll. of Agriculture and Home Economics.
For primary bibliographic entry see Field 5G.
W76-05173

POLLUTION -- SHIPOWNERS' LIABILITY NOT LIMITED BY LIMITATION OF LIABILITY ACT. THE OCEAN EAGLE, 1974 AMC 1629 (DPR 1974) (DICTUM),
For primary bibliographic entry see Field 5G.
W76-05184

PROTECTING PUBLIC HEALTH FROM HAZARDOUS SUBSTANCES: FEDERAL REGULATION OF ENVIRONMENTAL CONTAMINANTS,
Environmental Law Inst. Washington, D.C.
For primary bibliographic entry see Field 6G.
W76-05185

COMPELLED SELF-DISCLOSURE AND CIVIL PENALTIES: THE LIMITS OF CORPORATE IMMUNITY IN OIL SPILL CASES,
For primary bibliographic entry see Field 5G.
W76-05186

DEFICIENCIES IN THE REGULATORY SCHEME OF THE FEDERAL WATER POLLUTION CONTROL ACT AMENDMENTS OF 1972,
For primary bibliographic entry see Field 5G.
W76-05187

ENVIRONMENTAL PROTECTION AND THE ROLE OF THE CIVIL MONEY PENALTY: SOME PRACTICAL AND LEGAL CONSIDERATIONS,
For primary bibliographic entry see Field 6G.
W76-05188

ENVIRONMENTAL PROTECTION IN CALIFORNIA: COURT ACTION POWERS OF STATE AND LOCAL GOVERNMENT ATTORNEYS,
For primary bibliographic entry see Field 6G.
W76-05189

ENVIRONMENTAL CLASS ACTIONS IN THE FEDERAL COURTS - PEERING THROUGH THE ZAHN SMOG,
K. G. Bouchard.
Boston College Industrial and Commercial Law Review, Vol. 16, p. 609-629, (1975), 21 p.

Descriptors: *Water pollution control, *Federal jurisdiction, *Penalties(Legal), *Legal aspects, *Pollution abatement, Judicial decisions, Federal government, Water law, Environmental effects, Jurisdiction, Water pollution, Water quality, Water quality control, Organizations, Legislation, Legal review, Damages.
Identifiers: *Class action suits, Injunctive relief, Rule 23(FRCP), Water Pollution Control Act.

This article discusses the availability of environmental class actions in Federal Courts following the United States Supreme Courts holding in Zahn V. International Paper. In that case the Court held that each plaintiff in a Federal Rule 23(b) (3) class action must satisfy the $10,000 jurisdictional amount. The author thinks this may have a fatal effect on claims of plaintiffs seeking only monetary relief in environmental class actions. However, Zahn will have little effect on environmental class actions where the primary relief sought is injunctive. The author points out that jurisdiction specifically granted to citizens under the Water Pollution Control Act provides an alternative to class actions in most situations covered by the Act. (Nursey-Florida)
W76-05190

COMMON LAW REMEDIES FOR SALT POLLUTION,
R. E. Wardlaw.
Natural Resources Journal, Vol. 15, p. 353-384, (1975), 32p.

Descriptors: *Southwest U.S., *Water pollution, *Saline water intrusion, *Remedies, *Irrigation, Legal aspects, Judicial decisions, Water law, Water rights, Prior appropriation, Competing uses, Water requirements, Water pollution sources, Water pollution effects, Water pollution abatement, Water quality control, Saline water, Penalties(Legal), Farms, Irrigation systems, Common law.
Identifiers: Injunctive relief, Standing(Legal).

This article discusses the common law right of a downstream water rights holder to water of usable quality and, if that right is infringed upon, the legal remedies available to him. In particular it focuses on the problems faced by farmers in the southwest resulting from increased salinity levels in streams used for irrigation. Also examined are legal definitions of pollution, the nature of the appropriative right, and possible sources of legal protection for that right. It is the author's view that a private right holder who uses water for irrigation and whose right is damaged or destroyed by saline pollution has a cause of action against the person responsible, particularly if the polluter's water right is junior in time or priority. From a practical standpoint, however, the individual farmer may find the cost of bringing suit prohibitively high. (Nursey-Florida)
W76-05191

STATE REGULATION OF FEDERAL WATER APPROPRIATIONS: THE CALFORNIA EXPERIENCE,
California State Dept. of Justice, San Francisco.
R. E. Walston.
Rocky Mountain Mineral Law Institute Annual, Vol. 20, p. 721-742 (1975), 22 p.

Descriptors: *Appropriation, *California, *Federal-state water rights conflict, *Administrative agencies, Federal Water Pollution Control Act, Legislation, Regulation, Reclamation, Reclaimed water, Irrigation, Permits, Water, Water law, Legal aspects, Water rights, Irrigation practices.
Identifiers: FWPCA Amendments of 1972, Dam effects, Water rights(Non-riparians).

The Federal Government and the state of California have become involved in a dispute over control of water stored at federal dams. The Central Valley Project is a series of dams, developed by the United States Bureau of Reclamation, to transport water from rural to urban areas. Under California law, each appropriation, including the federal government, must obtain a permit. The State environmental quality act, which requires agencies to consider the environmental effects of such projects, often conflicts with the Bureau's objectives of maximum water appropriation. Recently proposed dams have encountered opposition from environmental groups. In resolving these disputes, courts have recognized that the federal government has animplied right for water appropriation. Where reclamation is the goal, however, it has been argued that state jurisdiction should be paramount because this function serves local interests. The Supreme Court has indicated that the Reclamation Act of 1902 does not allow state regulation of a federal project. However, the 1972 FWPCA amendments strengthen the arguement that some state regulation over federal agencies is desirable. Whether this requires compliance with state procedural requirements has not been determined. (Jenkins-Florida)
W76-05192

MINING AND THE FEDERAL WATER POLLUTION CONTROL ACT AMENDMENTS OF 1972,
Amax, Inc., Denver, Colo. Law Dept.
For primary bibliographic entry see Field 5G.
W76-05193

THE COLORADO RIVER SALINITY PROBLEM WITH MEXICO,
For primary bibliographic entry see Field 5G.
W76-05194

KENNETH BAILEY MEMORIAL LECTUR' THE SEABED IN LAW',
V. Windeyer.
Federal Law Review, Vol. 6, No. 1, p. 1-25, (1974), 25 p.

Descriptors: *Continental shelf, *International law, *Treaties, *International waters, *Australia, Foreign countries, Judicial decisions, Jurisdiction, Mining, Natural resources, Water law, Political aspects, History, Commercial fishing, Ownership of beds, Boundary disputes, Boundaries(Property), Water rights, Legal aspects.
Identifiers: Territorial waters, Seabed ownership, Legislation(Foreign).

In this lecture the historical antecedents of seabed ownership by the Australian Commonwealth and its states are examined. Seabed ownership is inextricably linked to the idea of the 'Continental Shelf', itself more a political than geological concept. National claims to exclusive rights in the shelf are an extension of the territorial sovereignty concept. However, when the shelf is common to two countries, or has a break in it, this theory is inadequate. Historically, the exercise of colonial jurisdiction over the territorial seabed did not make the seabed a colonial possession. But judicial decisions in other commonwealth nations support the lecturer's conclusion that the commonwealth nation and not its member states have paramount rights in the seabed. The 1973 Seas and Submerged Lands Act incorporates this position. The debate is far from over, however, since rights in territorial seas become increasingly complex as interest in the energy resources of the seabed grows. (Jenkins-Florida)
W76-05195

NEWFOUNDLAND'S CASE ON OFFSHORE MINERALS: A BRIEF OUTLINE,
Newfoundland Ministry of Mines and Energy, St. John's.
C. Martin.
Ottawa Law Review, Vol. 7, No. 1, p. 34-61 (1975), 28 p.

Descriptors: *Ownership of beds, *Canada, *Jurisdiction, *Mining, *Continental shelf, State government, Federal government, Local government, Political aspects, Constitutional law, Legal aspects, Oil industry, Governmental interrelations, Legislation, Treaties, Atlantic ocean, Coasts, Mineral industry jurisdiction, Boundaries(Property).
Identifiers: *Newfoundland, *Offshore mineral rights, Seabed mining, Comparative law, Coastal waters.

The province of Newfoundland claims rights to mineral resources off the continental shelf superior to those of the Canadian federal government. Legal basis for the claim is that ownership of natural resources not expressly transferred to the Crown is retained by the provinces. Most commentators have ignored the complex legal underpinnings of this claim: One problem is whether Newfoundland possessed all the rights of a sovereign state when it joined Canada. The author believes that such proof is not essential to establish the province's claim. When continental shelf rights exist, they need not be declared or exercised. A policy approach to deciding ownership is unnecessary where the legal position is clear, although, in support of provincial ownership, these five basic policy arguments are advanced: (1) public revenue generation; (2) industrial development; (3) social disruption; (4) provincial autonomy; and (5) effective administration. Examined also are Ontario's ownership rights and jurisdiction over Lake Erie's natural resources which serve as precedent for provinicial ownership of offshore minerals. (Jenkins-Florida)
W76-05196

DEMENTIA PISCATORIA-SANITAS MALTA: THE INTERNATIONAL SEA SERVICE,
P. G. Lomhoff.
Ecology Law Quarterly, Vol. 4, No. 2, p. 319-341 (1974), 23 p.

Descriptors: *Fishing, *International Joint Commissions, *Fish conservation, *Fish management, *United Nations, United States, Foreign countries, Jurisdiction, Boundary disputes, Legal aspects, Regulation, International law, International waters, Coasts, Adoption of practices, Technology, Administration, Administrative agencies, Water resources development, Fish migration, Oysters, Salmon.
Identifiers: Territorial waters, International Sea Service(ISS), Inter-American Tropical Tuna Commission(IATTC), Continental Shelf Convention.

Declining fish catches and the imminent demise of certain fisheries due to overfishing point up the need for a strong international regulatory body to replace the current hodgepodge of international fishing laws. This article surveys some of the legal difficulties frustrating fisheries management and then advocates United Nations adoption of the proposed International Sea Service (ISS) as a means of overcoming them. The Service would be a U.N. specialized agency providing other U.N. agencies with operational capabilities at sea in areas ranging from seabed surveys to meteorology. As regards international fishing, the ISS would operate to provide: (1) research to produce the data necessary for rational exploitation; (2) education and technical assistance for fishermen and fisheries scientists; and (3) regulatory recommendation for the use of regional or other fisheries organizations. While the ISS would not encroach upon present national sovereignty or perogatives, its mere presence as a respected neutral scientific organization might act as a deterrent to potential violations of international fishing regulations. (Parrish-Florida)
W76-05197

ILLINOIS ENVIRONMENTAL LAW--THE NEW ASSAULT ON WATER POLLUTION,
Hackbert, Rooks, Pitts, Fullagar and Poust, Chicago, Ill.
For primary bibliographic entry see Field 5G.
W76-05198

THE U.K./ICELANDIC FISHERIES CASE,
D. W. Bowett.
The Cambridge Law Journal, Vol. 33, Part 2, p. 179-181 (1974). 3 p.

Descriptors: *International law, *Fishing, *Boundary disputes, *International waters, Law

of the sea, Regulation, Administration, Jurisdiction, Foreign countries, Treaties, Political aspects, Legal aspects, Judicial decisions, Coasts, International commissions, Water, Water law.
Identifiers: *Coastal zones, Water rights(Non-riparians), High seas, Economic zones, Preferential rights, Coastal waters, Territorial waters.

The judgement of the International Court of Justice on the Merits of the Fisheries Jurisdiction Case was a ten to four decision in favor of the United Kingdom, thereby denying Iceland's claims of an exclusive 50-mile fishery zone. The majority of the court agreed that, in the decade of 1960-1970, two concepts had crystallized as customary law: the notion of an exclusive 12-mile fishery zone, and the preferential rights of the coastal state. Given the long-established United Kingdom fishing practice, the court concluded: (1) that an exclusive claim was invalid against the United Kingdom; (2) that to hold otherwise would be an infringement of the principle of freedom of the High Seas; (3) that a phase-out of United Kingdom fishing would not be a sufficient recognition of their rights; and (4) that the parties were under an obligation to negotiate an equitable solution. Also briefly examined are the four dissenting opinions, and the relevance of various United Nations resolutions supporting a 200 mile 'economic zone'. (Parrish-Florida)
W76-05199

COLORADO RIVER SALINITY PROBLEM: HAS A SOLUTION BEEN FOUND,
Denver Univ., Colo. Coll. of Law
M. E. Bulson.
International Lawyer, Vol. 9, No. 2, p. 283-294 (1975), 12 p.

Descriptors: *Mexico, *Reasonable use, *Saline water, *Colorado River, *Desalination plants, Treaties, Water purification, Water pollution sources, Desalination processes, International law, Riparian rights, Saline water-fresh water interfaces, Saline water intrusion, Mixing, Irrigation waters, Dams, Damages, Costs, Desalination.
Identifiers: International disputes, International Court of Justice.

An agreement between the United States and Mexico was signed in 1973 concerning the Colorado River salinity problem. The agreement calls for the construction of a desalination plant in Arizona, which should reduce the salinity of the water received by Mexico to a level equal to that at Imperial Dam in Arizona. This paper analyzes the contribution of the agreement, to show in what ways it differs from past U.S. policy and in what ways it can serve as precedent for the amicable resolution of international river disputes. The salinity problem was the result of the 1944 Water Treaty under which the United States was to deliver water from the Colorado River to Mexico. The United States contended for many years that its obligation was to deliver any type of water, and not necessarily usable water. Mexico threatened to take its case to the International Court of Justice where it would have argued that, while the lower riparian cannot expect water of the same quality as the upper riparian, he has a right to water of reasonable quality for reasonable purposes. It is likely that the International Court would have agreed with this argument; hence, the new desalination plant. (Hoffman-Florida)
W76-05200

ALLOCATION OF FUTURE WATER USE BY A PUBLIC UTILITY (CASE COMMENT ON INTERWEST CORP. V. PUBLIC SERVICE COMMISSION),
S. Sperry.
Utah Law Review, Vol. 1974, No. 2, p. 444-452 (1974), 9p.

Descriptors: *Water allocation(Policy), *Preferences(Water rights), *Water rights, *Public utilities, Beneficial use, *Utah, *Permits, Future planning(Projected), Legislation, Project planning, Prior appropriation, Regulation, Judicial decisions, Water demand, Water control, Water supply, Distribution, Water requirements.
Identifiers: Water rights(Non-riparian), State policy, Future allocation system, Western states.

The policy behind water law in the western states where water is scarce is to assure an adequate water supply for the greatest public benefit. The doctrine of beneficial use, codified under Utah law, gives preference to prior appropriators of water who continue to make immediate and beneficial use of the water. In determining who has prior beneficial rights the permit system is used. In Interwest Corp. v. Public Service Commission, the Utah Supreme Court applied the beneficial use doctrine to public utilities and held that the state utility regulatory body could not sanction denial of a permit based on future use of water. The court based its holding on a narrow statutory ground, but implied that a public utility which rendered services based on future allocation of water would be exercising unlawful discrimination. The court left unresolved the conflict between water law principles and the regulatory agencies' obligation to provide for the orderly and economical development of public utility resources. Without a future allocation system, developers cannot be assured of a continuing adequate water supply. Such certainty is good public policy. However, discrimination against prior appropriators would be inevitable under a future allocation system, and such discrimination is clearly prohibited by statute. The holding in the instant case invites legislation which would authorize a public utility to use a future allocation system. (Jenkins-Florida).
W76-05201

PEOPLE'S CHINA AND THE LAW OF THE SEA,
C. D. Bethill.
The International Lawyer, Vol. 8, No. 4, p. 724-751 (1974), 38 p.

Descriptors: *Law of the Sea, *Foreign countries, *Foreign waters, *Continental shelf, *Beds under water, Beds, Ownership of beds, Navigable waters, Navigation, Governments, Asia, International law, International waters, Water law, Zoning, Oceans, Fishing, Straits, Bays, Sounds, inland waterways, Islands, Research and development, Jurisdiction, Political aspects.
Identifiers: Coastal waters, Territorial waters, Water rights(Non-riparians).

This article describes the Chinese position on questions concerning their territorial sea, zones of special jurisdiction, the high seas, the continental shelf, and the deep sea bed. The author comments on the differences between the Chinese position and other states, and analyzes their motivations and goals. First, the author presents the Chinese definition of the territorial sea and discusses the determination of its breadth, and the Chinese claim as to the extent of their own territorial sea. Further, the author considers navigational rights through the straits and bays in the vicinity of coastal islands. Generally, the Chinese have supported the doctrine of freedom of the high seas, but have taken a severely restrictive view of foreign passage through territorial waters. In order to protect coastal state fishing, the Chinese favor the creation of certain zones of special jurisdiction in the area beyond the territorial sea. Yet, the article suggests that the Chinese position on the seabed is that the resources are commonly owned by all peoples in the world. While the Chinese Government lacks specificity in its positions, they may be expected to increase their interest and involvement in the area of law and politics. (Fernandez-Florida)
W76-05202

THE ECONOMICS OF CLEAN WATER - 1973.
Environmental Protection Agency, Washington, D. C.
For primary bibliographic entry see Field 5G.
W76-05203

COASTAL ZONE MANAGEMENT: THE PROCESS OF PROGRAM DEVELOPMENT,
Coastal Zone Management Inst., Sandwich, Mass.
For primary bibliographic entry see Field 6B.
W76-05204

COAST GUARD MISCELLANEOUS-PART 2(CONVENTION ON HIGH SEAS POLLUTION H. R. 5975).
For primary bibliographic entry see Field 5G.
W76-05205

FLOOD DAMAGE.
House of Rep. Comm. on Public Works, Rep. No. 93-1482, 93d Cong, 2d Sess, Nov. 19, 1974. 4 p.

Descriptors: *Legislation, *Federal government, *Oysters, *Flood damage, *Estuarine fisheries, Fisheries, Louisiana, United States, Water law, Legal aspects, Floods, Flood control, Estuaries, Salinity, Flood routing, Floodgates, Flooding, Floodwater, Salt balance, Saline water, Equity, Leases, Mississippi River Basin, Mississippi River.
Identifiers: *Oysterbeds, Coastal waters, Sovereign immunity.

The Committee on Public Works has recommended the passage of S. 2201, a bill providing for the settlement of damage claims arising out of actions taken by the United States in opening certain spillways. Flooding in the Mississippi River Valley in the spring of 1973 made it necessary to open the Bonnet Carre spillway and the Morganza Floodway in order to direct waters from populated areas downstream. This action was successful but had serious adverse effects on oysterbeds into which the diverted waters flowed. Sixty-eight percent of all the oysterbeds under lease by the State of Louisiana were affected. This legislation authorizes the President or his designee to settle claims against the United States for losses incurred by oyster fishermen. The Committee believes that this relief is justified since the damages were the direct result of actions of the Army Corps of Engineers, and affected fishermen may loose their livelihood for two or more years. It is intended that such relief will be granted only to those holding a leasehold or similar property interest. The cost to the United States resulting from this legislation is not to exceed $5 million. (Schilling-Florida)
W76-05206

EMERGING OCEAN OIL AND MINING LAW,
North Carolina Univ. at Chapel Hill. School of Law.
S. W. Warfel.
Available from the National Technical Information Service, Springfield, Va, 22161, as COM-74-11014, $3.75 in paper copy, $2.25 in microfiche. Prepared for NOAA Sea Grant Program, North Carolina State University, Raleigh, NC, COM-74-11014, March 1974. 61 p, 58 ref, 3 map.

Descriptors: *International law, *Oil industry, *Mining, *Offshore platforms, International commissions, Foreign waters, Treaties, Law of the Sea, International waters, China, Boundary disputes, Mining engineering, Exploration, Manganese, Continental shelf, Oceans.

Six papers by different authors explore aspects of ocean resource law, primarily from an international perspective. 'International Regulation of Petroleum Exploration' describes economic and legal barriers to deep-water resource utilization. Multinational control of oil spills, tanker discharge, and off-shore drilling is examined via

international agreements, while Chinese response to offmshore drilling is treated geopolitically. Exploitation of manganese nodules and, more broadly, non-living oceanic resources are considered. Analysis of the North Carolina Oil Pollution Control Law and state efforts to curb pollution of the sea completes this well annotated research document. (Knocke-Florida)
W76-05207

TENNESSEE VALLEY AUTHORITY POLLUTION PREVENTION FACILITIES.
House of Rep. Conference Report No. 93-1512, 93d Cong, 2d Sess, Dec. 3, 1974. 5 p.

Descriptors: *Water pollution control, *Tennessee Valley Authority, *Facilities, *Legislation, *Federal government, State governments, Governmental interrelations, Water, Water law, Legal aspect, Water pollution sources, Abatement, Water pollution, Air pollution, Costs.
Identifiers: Certification, State policy.

A Congressional conference committee has agreed on amendments to the Tennessee Valley Authority (TVA) Act of 1933 which provide that expenditures for pollution control facilities will be credited against required power investment return paymets and repayments. Beginning in fiscal year 1976, the Corporation may elect to defer scheduled payments for one year if expenditures for certified pollution control facilities for the preceding fiscal year exceed the amount of the scheduled repayment. During the same period the corporation will be entitled to credit against payments, required as a return on investment, the amount of expenditures which are in excess of the amount of any deferred repayment. The term 'certified pollution control facility', defined in the amendment, applies to both water and air pollution control facilities. For deferral or credit to be obtained the facilities must be certified by the appropriate State certifying agency as being in conformity with State pollution policies, and by the Administrator of the Environmental Protection Agency as being in compliance with applicable Federal regulations; and in furtherance of general pollution control policy under the Federal Water Pollution Control Act and the Clean Air Act. (Schilling-Florida)
W76-05208

EXTENSION OF THE MARINE PROTECTION, RESEARCH AND SANCTUARIES ACT OF 1972.
For primary bibliographic entry see Field 5G.
W76-05209

PUBLIC WORKS FOR WATER AND POWER DEVELOPMENT AND ATOMIC ENERGY APPROPRIATION BILL, 1975.
Hearings--Subcomm of the Comm. on Appropriations, U.S. House of Representatives, 93d Cong, 2d Sess, part 6, 1974. 284 p.

Descriptors: *Tennessee Valley Authority, *Federal government, *Economics, *Water management(Applied), *Flood control, Administrative agencies, Administrative costs, Administrative decisions, Navigation, River, Navigable rivers, Inland waterways, River systems, Dams, Regulation, Transportation, Comprehensive planning, Resources development, Interstate commission, Government supports, Water resources development, Resources allocation, Intergovernmental relations, Water allocation(Policy), Water law, Water policy, Judicial decisions.
Identifiers: State policy, Private interest groups, Administrative regulations, *Congressional hearings.

The hearing deals with appropriations for the Tennessee Valley Authority (TVA). At that hearing the chairman of the TVA outlined the proposals and specific plans sought to be funded in the following year. Inter alia the hearing concentrated on several issues of specific importance to water law. After highlighting the environmental awareness and concern for environmental protection, current problems were discussed. The delay in the closure of Tellico dam was due to a suit by environmentalists invoking the National Environmental Policy Act which, although ultimately resolved in favor of the TVA delayed closure by seven years. Similarly, dam xonstruction on the Duck River Project was enjoined and is being litigated. Other dam and waterway improvement programs are referred to and reviewed as possible duplications of effort with the Environmental Protection Agency since they relate to water quality management. Included is a project-by-project review of the progress in construction, current litigation, and benefit to sluppers in terms of added navigability of rivers. At the time of the hearing TVA had in excess of 700 miles of navigable river under its authority. In short, the hearing represents an assessment by the TVA of its current and future activities in the areas of water management, quality control and navigation. (Salley-Florida)
W76-05210

PERSPECTIVES ON THE ARMY ENGINEERS WATER MANAGEMENT MISSION,
Corps of Engineers, Washington, D.C.
W. C. Gribble, Jr.
Water Spectrum, Vol. 6, No. 3, p. 1-9, (1974). 9 p. 10 photo.

Descriptors: *Water resources, *Water resources development, *Flood control, *Flood protection, Flooding, Floods, Harbors, Great Lakes, Energy, Water, Recreation, Erosion, Erosion control, Erosion rates.
Identifiers: *Environmental Impact Statement(EIS).

1974 marked the 150th anniversary of the Corps of Engineers, prompting the Corps' Chief of Engineers to take stock of the Corps' past experience as well as to contemplate changing public needs. In addition to working on national problems, the Corps is also devoting an increasing share of its planning capabilities to helping state and local authorities develop programs for water resources management in accordance with their own priorities. Corps investments in water resource projects already built have been repaid many times over. Flood control works have brought security from the ravages of floods to hundreds of cities and towns. Deep-draft harbors have opened the cities of our seacoasts and Great Lakes to the flow of international commerce. Inland waterways have linked vast internal regions together through an effective low-cost transportation system. Other benefits of Corps programs have included better water supply, recreation, erosion control and provision for fuller utilization of unemployed or underemployed resources in depressed areas. It is expected that the historical record of accomplishment under the Corps Civil Works Program, which has been both substantial and responsive, will continue to meet the Nation's expanding needs. (Gagliardi-Florida)
W76-05211

REGULATION ADOPTING EFFLUENT LIMITAIONS AND GUIDELINES FOR WASTEWATER DISCHARGES TO THE SURFACE WATERS OF NORTH CAROLINA.
North Carolina Dept. of Natural and Economic Resources, Raleigh. Div. of Environmental Management.
For primary bibliographic entry see Field 5G.
W76-05212

SEWAGE TREATMENT AND DISPOSAL SYSTEMS.
Ore. Stat. Sects. 454.010 thru 454.745, 1973. 7 p.

Descriptors: *Bond issues, *Oregon, *Federal Water Pollution Control Act, *Rates, *Sewage treatment, Disposal, Municipal wastes, Industrial wastes, Legislation, Financing, Economics, Construction costs, Maintenance costs, Regulation, Inspection, Permits, Penalties(Legal).
Identifiers: *Sewage disposal systems, Procedural requirements.

Pursuant to the Federal Water Pollution Control Act, Oregon may require each user of the treatment works of a municipality to allow inspections to insure compliance with pretreatment effluent standards. In addition, to insure that sewage treatment costs are equitably apportioned, municipalities may institute a rate system designed to make each recipient of treatment works pay his proportionate share. Under this statute, industrial users may be required to pay the cost of treatment works needed to meet the users waste requirements. Similar powers are given to municipalities concerning the ratemaking and financing of disposal systems. In addition, municipalities may also issue bonds for the construction of a disposal system if their issuance is approved by a majority of the electorate. The statutes also allow the installation and maintenance of alternate sewage disposal systems if a permit is obtained. A list of factors is presented which should be considered by the appropriate agency when adopting standards for the regulation of such systems. Finally, the statute presents regulations governing sub-surface sewage disposal systems. These regulations cover various aspects including: standards for such system; procedural requirements when violations of standards are alleged; thepermit system; inspection requirements; the performance of sewage disposal services; and the legal penalties for violation of any provision. (Hoffman-Florida)
W76-05213

WASHINGTON WASTES DISCHARGE PERMITS.
Washington Pollution Control Commission, Olympia.
1973 BNA Environmental Rep. 941: 0621-22 (Wash. Ad. Code, Ch. 372-24, 1968). 2 p.

Descriptors: *Washington, *Industrial wastes, *Permits, *Water pollution, *Water pollution control, *Waste disposal, Legislation, Legal aspects, Law enforcement, Regulation, Water law, State governments, Water pollution sources, Water quality, Water quality control, Pollutants, Pollution abatement.

The State of Washington has adopted regulations for the issuance of permits for the discharge of wastes into state waters. These regulations provide that persons operating specified types of commercial or industrial operations must obtain a permit if they intend to use state water for the disposal of wastes. Any commercial or industrial operation not specifically listed must also obtain a permit if it discharges significant amounts of wastes. A temporary permit will be issued if an operation require time to correct its present waste disposal system to conform to legal requirements. A permanent permit will be issued when an applicant fully complies with conditions specified by the pollution control commission and the commission finds that the operation's proposed disposal of wastes does not unduly pollute the receiving water. Furthermore, any person conducting an operation which results in the discharge of waste material into state waters without first complying with permit requirements will be deemed in violation of the Pollution Control Act. (Nursey-Florida)
W76-05214

OIL SPILLAGE REGULATION.
1974 BNA Environmental Rep. 886: 0105-06 (Ore. Rev. Stat. Sects. 468.780 thru 468.815 and Section 468.992). 2 p.

Descriptors: *Oregon, *Oil spills, *Oil wastes, *Cleaning, *Water quality control, Oil pollution, Waste water(Pollution), Economics, Penalities(Legal), Legal aspects, Damages, Water pollu-

tion sources, State jurisdiction, Federal jurisdiction, Permits, Water policy, Costs, State governments.
Identifiers: *Oil clean-up operations.

In order to protect the environment, the Oregon regulation makes it unlawful for oil to enter state waters from any source. Except for certain statutoruy exceptions, the person having control of the oil shall be absolutely liable for the damage caused by such spills unless he had obtained a permit. In addition to other liabilities, the person having control of the oil shall be required to collect and remove the oil immediately. If the oil's collection is not possible, the person must take all practicable actions to contain, treat or disperse the oil. Any substance used to aid in such action which is found to be harmful to the public interest may be subject to restriction or prohibition. If the person fails to take any steps to collect the oil, the state is authorized to begin the clean-up operation. Adequate expense records must be kept so that the offender can be charged for all reasonable costs incurred. If these expenses are not paid, the state attorney general is authorized to bring suit for its collection. Penalties which are collected go into the Oil Spillage Control Fund, which will finance necessary state actions under these provisions. (Hoffman-Florida)
W76-05215

WYOMING ENVIRONMENTAL QUALITY ACT,
1975 BNA Environmental Rep. 956:0201-18 (Enrolled Act No. 107., 1973, as amended 1974 and 1975). 18 p.

Descriptors: *Wyoming, *Administrative agencies, *Water quality standards, *Solid wastes, *Permis, Effluents, Waste disposal, Water supply, Personnel, Training, Administratives decisions, decision making, Regulation, Legislation, Water resources development, Natural resources, State government.
Identifiers: *Disposal sites.

To serve as the central governmental unit in overseeing the protection and development of state natural resources, the Wyoming Department of Environmental Control is created. The department will consist of three divisions, land, air and water; and the director shall appoint an administrator to head each of these divisions. The administrator of the water division shall be vested with numerous power including: the power to issue, deny or revoke permits; the power to require owners or operators of any point source to maintain adequate records and provide periodic sampling of effluent discharges; and the power to supervise all research projects and investigations. The administrator will also make recommendations to the director concerning the promulgations of regulations pertaining to water quality standards, effluent standards and limitations, standards for technical competency and certification of water supply and sewerage system operating personnel, and standards for the issuance of permits.A list of factors is presented which should be considered by the administrator in recommending any standards or regulations. The director of the department is given the authority to coordinate state activities concerned with solid waste management and must give his approval to all proposed solid waste disposal sites. If water quality standards would be violated at the proposed site, approval will be denied.(Hoffman-Florida)
W76-05216

WYOMING PROTECTION OF PUBLIC WATER SUPPLY ACT,
1973 BNA Environmental Rep. 956:0101-03 (Wyo. Protection of Pub. Water Supply Act as amended by Senate Enrolled Act No. 107, 42d sess. 1973). 3 p.

Descriptors: *Wyoming, *Potable water, *Public health, *Water supply, *Permis, Inspection, Saw mills, Minning, Water quality standards, Water quality control, Domestic water, Water purification, Water pollution, Sewage disposal, Waste water treatment, Watersheds(Basins), Water purification.
Identifiers: Administrative investigation.

To insure a high quality of public drinking water, the Wyoming State Board of Health must advise local authorities on the best methods for assuring water purity. In addition, the Board must approve all permits before any municipally, individual or corporation may construct or make additions to any water supply, drainage or sewage disposal system. Approval must also be obtained for the construction of specified structures upon or over any watershed of any public water supply system. To insure compliance with these regulations, the Board of Health is authorized to initate a thorough investigation upon the receipt of any complaint alleging the unauthorized pollution of any water supply source. To aid in such investigations, the Board is authorized, upon the issuance of a search warrant, to inspect any building or premise where a water supply violation is thought to exist. Any person who is adversely affected by the actions of the Board may appeal to the appropriate court. Because of the severe pollution that can be caused by sawmills and mining operations, a special provision relating to their regulation is presented. Finally, the statue requires that the Board make periodic bacteriological analyses of drinking water supplies. If predetermined quality standards are not met, immediate action must be taken by the operator of the water supply system. (Hoffman-Florida)
W76-05217

MONTANA ENVIRONMENTAL POLICY ACT,
Montana Environmental Quality Council, Helena.
1973 BNA Environmental Rep 831:0201-04 (Mont Rev Code, Title 69, Ch 65, 1971). 4p.

Descriptors: *Montana, *Natural resources, *Legislation, *Adkministrative decisions, *Environmental control, Environment, Ecology, Safety, Programs, Projects, Jurisdiction, Maintenance, Planning, Management, Conservation, Investigations, Air, Surveys, Groundwater, Surface waters, Labor, Argriculture.

Montana has adopted an Environmental Policy Act the purpose of which is to declare a state policy encouraging 'productive and enjoyable harmony between man and his environment'. Under the Act it is the responsibility of the state and its agencies to carry out this policy to the fullest extent possible. An environmental quality council consisting of thirteen members is established, no member of which shall serve for more than six years. In addition, a qualified executive director shall be appointed by the council to serve for two years, but subject to removal for cause at any time after notice and a hearing. The executive director may appoint what-ever employees are necessary to carry out the duties specified in the Act and shall make available to the governor, the legislature, and the general public an annual environmental quality report. Finally, the council shall have authority to hold hearings and shall have all authority necessary to conduct such hearings. (Segall-Florida)
W76-05218

NEBRASKA DOMESTIC AND INDUSTRIAL LIQUID WASTES DISPOSAL RULES.
Nebraska Environmental Control Council, Lincoln.
1973 BNA Environmental Rep 836:0541-42 (Neb Environ Control Council Rules and Regs, 1972). 2p.

Descriptors: *Construction, *Water quality standards, *Nebraska, *Waste water treatment, *Waste water disposal, Water pollution control, Water quality, Water pollution, Water pollution treatment, Sewerage, Water quality control, Waste water(Pollution), Sewage treatment, Sewage effluents, Sewage disposal, Sewage, Pollution abatement, Waste disposal, Administrative decision.

To implement the Nebraska Water Quality Standards Act, the Nebraska Environmental Control Council herein sets forth the rules and regulations pertaining to disposal of domestic and industrial liquid wastes. The policy of the Council is to prevent, control and abate existing or potential pollution by monitoring such pollution by liquid discharge, and by enforcing the rules under this Act. Any waste water discharge is prohibited unless prescribed treatment has been provided and such treated wastewater is notdetrimental to the quality of the receiving waters or lands. All sewage works must submit complete plans and drawings for any new constructions or alterations, and such works must be capable of meeting the effluent standards of the Act. Any material changes in the approved plans and specifications which affect either capacity or sanitary features must be submitted along with a written statement of the reasons for such changes. A construction permit is valid only if construction is started within one year and is completed within three years of the date of approval. Failure to comply with these regulations is grounds for both administrative enforcement and criminal proceedings. A schedule of fines is set forth. (Welch-Floria)
W76-05219

KANSAS AGRICULTURAL WASTES REGULATIONS.
1973 BNA Environmental Rep 781:0701-02 (Kan Stat, Ch 28, Art 18, 1967). 2p.

Descriptors: *Kansas, *Waste water(Pollution), *Feed lots, *Permits, *Waste treatment, Water pollution control, Ponds, Foods, Crops,Cattle, Sheep, Lagoons, Fish, Wastes, water quality, Public health, Beneficial use. Discharge(Water), Drainage, Streams, Surface runoff, Drainage area.

Under Kansas' Agricultural Wastes Regulations the operation of any newly proposed confined feeding operation for food animals, fur animals, or pleasure animals, must register with the State Department of Health prior to construction and operation of any lot, pen, pool, or pond. If in the opinion of the department a confined feeding operation has water pollution potential, the operator shall provide water pollution control facilities constructed in accordance with plans and specifications approved by the department. Water pollution control facilities shall not be placed in use until a permit has been issued following satisfactory completion of construction in accordance with plans and specifications approved by the department. Minimum requirements for water pollution control facilities for cattle, swine sheep, and other domestic animals are set forth. Finally the water pollution control facilities shall be operated and maintained so as to prevent water pollution, to protect the public health, and to insure the beneficial use of waters of the state. (Segall-Florida)
W76-05220

MICHIGAN GENERAL PROVISIONS AND PROCEDURES REGULATIONS.
Michigan Dept. of Natural Resources, Lansing. Water Resources Commission.
1973 BNA Environmental Rep 811:0501-03 (Mich Ad Code Part 1, Gen Prov, and Part 2, Orgs, Ops, and Proceds 1972). 3 p.

Descriptors: *Michigan, *Water resources, *Administrative agencies, *Adoption of procedures, *Waste disposal, Water pollution control, Flood control, Natural resources, Agriculture, Public health, Inspection, Conservation, Permits, Sewage treatment, Construction, Grants,

Surveys, Discharge(Water), Beach erosion, Flood plains.

Michigan has adopted 'General Provisions and Procedures' for regulating the organization of the water resources commission of the state. The commission is to administer programs of water pollution control, water planning basic data collection flood control, beach erosion control and others. The commission is also authorized to issue orders and permits for filling and other regulated activities in flood plains. A person can thus request a declaratory ruling from the commission regarding a statute, rule or order administered thereby, upon submission in duplicate of a sworn petition to the commission. The commission will issue the declaratory judgement within 90 days of the receipt of such a petition. Also the commission is to hold public hearings on water pollution control problems. The executive secretary of the commission can seek the initiation of injunctive procedures to prevent the release of waste discharges from industrial or commercial processing operations into waters of the state. (Segall-Florida)
W76-05221

LICENSING AND REGULATION OF USE OF OIL SPILL CLEANUP AGENTS.
1974 BNA Environmental Rep 721:0527-29 (Calif. Water Code). 3 p.

Descriptors: *Water quality control, *Permits, *California, *Oil spills, *Oil pollution, Pollutants, Pollution abatement, Water pollution, Water pollution control, Water pollution treatment, Legal aspects, Regulation, Administrative agencies, Adoption of practices, Disasters, Oil, Legislation, State governments, Environmental control, Environmental effects, Oil wastes, Oily water.
Identifiers: *Licenses.

Pursuant to its goal of preventing and minimizing effects of oil spills, the state of California herein regulates the characteristics and application of substances used for cleanup operations to insure that the substances will effectively protect the environment. Any oil spill cleanup agent (OSCA) must be licensed by the state. This includes any substance applied to oil or water or associated shorelines for the purpose of oil dispersal or control. Each OSCA must comply with enumerated criteria, including a specified flash point, dispersant efficacy, and dispersant toxicity. Any OSCA must also be plainly labeled as such and must include recommended application procedures. A license may be issued to the manufacturer for each OSCA on a registered trademark name basis when the criteria have been met and tests have been submitted. The filing fee for an application is $100 plus a deposit of $900 to defray testing expenses. Finally, a license for an OSCA does not waive any other legal responsibilities of the manufacturer or user. (Welch-Florida)
W76-05222

ALASKA WASTEWATER DISPOSAL REGULATIONS.
1974 BNA Environmental Rep. 706: 0541-43 (Alas. Ad. Code (ACC), Title 18, Environ. Conserv., Ch. 72, 1973). 3 p.

Descriptors: *Permits, *Alaska, *Waste disposal, *Water pollution control, *Waste water(Pollution), Water pollution treatment, Water pollution, Waste water treatment, Waste water disposal, Water management(Applied), Water quality, Water purification, Sewage effluents, Sewage treatment, Administration, Legislation, State governments, Discharge(Water), Disposal, Penalties(Legal), Regulation, Environmental control, Surface waters, Subsurface waters, Septic tanks.

The discharge of sewage, industrial waste or wastewater in Alaska must meet the minimum required treatment standards as prescribed by statute. Moreover, the regulations forbid the discharge of surface wastewater into waters of the state or onto land nearby such waters. Any subsurface wastewater discharge is likewise prohibited without written state approval. Specific regulations applicable to septic tanks and soil absorption systems require written approval if construction or use of such a system is within 200 feet of a community sewerage system. Any agency constructing or modifying a sewerage system or treatment works must submit detailed engineering reports and specifications before beginning such construction. Furthermore, any agency or person operating a wastewater treatment works must also submit routine operational reports. Notification of any emergency situation in the operation of the treatment works must be given within 24 hours. Penalties for violation of any provision of the statute include fines and-or imprisonment. (Welch-Florida)
W76-05223

NEBRASKA FLOOD PLAIN REGULATIONS ACT.
For primary bibliographic entry see Field 6F.
W76-05224

REGULATION OF CONSTRUCTION WITHIN FLOOD PLAINS ESTABLISHED PURSUANT OF SECTION 65F, CHAPTER 19, ILLINOIS REVISED STATUTES.
For primary bibliographic entry see Field 6F.
W76-05225

CHANGES IN 1972 COLUMBUS CITY CODE (FLOOD HAZARD ORDINANCE.)
For primary bibliographic entry see Field 6F.
W76-05226

MODEL FLOOD PLAIN ZONING ORDINANCE (OHIO),
Mid-Ohio Regional Planning Commission, Columbus.
For primary bibliographic entry see Field 6F.
W76-05227

A THREE-DIRECTIONAL APPROACH TO FLOOD PLAIN MANAGEMENT, MINNESOTA EXPERIENCES,
Minnesota Dept. of Natural Resources, St. Paul.
For primary bibliographic entry see Field 6F.
W76-05228

ORDINANCE AMENDING SECTION 7-1 AND 7-2 OF ARTICLE 1 OF THE COLLIER COUNTY BUILDING CODE (FLOOD PLAIN AND COASTAL CONSTRUCTION).
For primary bibliographic entry see Field 6F.
W76-05230

FEDERAL LEGISLATION AND COMMON LAW ASPECTS OF ENVIRONMENTAL PROBLEMS IN CANADA,
Atlantic Richfield Canada Ltd., Calgary (Alberta).
B. L. Stroppa.
Alberta Law Review, Vol. 13, No. 1, p. 18-40 (1975). 23p, 217 ref.

Descriptors: *Oil industry, *Common law, *Oil pollution, *Canada, *Environmental effects, Geographical regions, Air pollution, Water pollution, State governments, Political constraints, Riparian rights, Water quality, Federal government, Judicial decisions, Legal aspects, Permits, Penalties(Legal), Regulation.
Identifiers: Canada Shipping Act, Arctic Water Pollution Prevention Act, Northern Inland Waters Act, Canada Water Act, Fisheries Act, Navigable Waters Act, Canadian Oil and Gas Production and Conservation Act, Clean Air Act, Nuisance(Legal aspects), Comparative law.

Due to potential adverse environmental effects, petroleum industry activity is subject to considerable statutory regulation in Canada. To provide a general background for this regulation, a brief survey of important legislation is presented concerning five specific geographical areas in Canada. The major acts discussed include: the Canada Shipping Act, the Arctic Water Pollution Control Act, the Northern Inland Waters Act, the Canada Water Act, the Fisheries Act, and the Navigable Waters Act. This statutory regulation is not all encompassing, however, and common law rights and remedies are often relied upon in ascertaining causes of action or liability in environmental suits. In order to update the significance of these common law actions as they relate to environmental litigation, a survey of pertinent case law pertaining to strict liability, nuisance, riparian rights, defenses to nuisance, and negligence is presented. This history notwithstanding, legislative regulation of environmental matters will become increasingly more important in Canada, while common law actions will be used only to fill in the gaps not covered by legislation. (Hoffman-Florida)
W76-05231

HEALTH ASPECTS OF UNCOVERED RESERVOIRS,
Washington State Dept. of Social and Health Services, Olympia.
For primary bibliographic entry see Field 5F.
W76-05232

EVALUATION OF STATE DRINKING-WATER-QUALITY SURVEILLANCE PROGRAMS,
Environmental Protection Agency, Atlanta, Ga. Region IV.
For primary bibliographic entry see Field 5G.
W76-05233

AN ORDINANCE RELATING TO DRAINAGE AND FLOOD CONTROL.
County of Kauai, Hawaii, Ordinance No. 155 (1971). 2 p.

Descriptors: *Hawaii, *Drainage, *Flood control, *Flood damage, *Permits, Storms, Floods, Safety, Rainfall, Overflow, Streams, Rivers, Hurricanes, Runoff, Land use, Channels, Structures, Construction, Tsunamis.
Identifiers: Tsunami inundation.

This ordinance recognizes that heavy rain storms, tsunamis, and hurricanes have caused floods resulting in loss of life and damage to property. The purpose of the ordinance is to regulate development in areas subject to flooding. No building permit shall be issued and no subdivision shall be approved without the approval of the County Engineer as to the adequacy of drainage. Any applicant for a building permit may be required by the County Engineer to submit plans for the improvement or construction of drainage facilities. Also any proposed new construction on a proposed building site located in an area subject to extreme water heights and destructive wave forces must be designed and constructed to resist the damages. (Segall-Florida)
W76-05234

FLOOD CONTROL AND FLOOD WATER CONSERVATION.
Hawaii Rev. Laws, secs 179-1 thru 179-4 (1963). 4 p.

Descriptors: *Hawaii, *Flood control, *Floodwater, *Safety, *Flood damage, Beneficial use, Rainfall, Drainage, Seismic waves, Surface waters, Subsurface waters, Runoff, Conduits, Ditches, Canals, Dams, Reservoirs, Building codes, Construction, Rivers, Streams, Lakes, Zoning.
Identifiers: *Floodwater conservation, Flood control projects.

The purpose of this chapter is to provide for the coordination by the state of all federal and state flood control projects undertaken in Hawaii. Upon enactment of this law, all flood control and flood water conservation and related activities, and any attendant powers and duties, not including flood disaster operations, are transferred to the Board of Land and Natural Resources. The flood control plan is to be regarded as a general guide for implementation of a statewide flood control program. The powers, duties and jurisdiction of the Board, including coordination of programs and activities, compilation and dissemination of information, rendition of technical assistance to political subdivisions, and formulation of flood control projects, are set forth. (Segall-Florida)
W76-05235

AN ORDINANCE AMENDING THE GREENSBORO CODE OF ORDINANCES WITH RESPECT TO ZONING.
For primary bibliographic entry see Field 6F.
W76-05236

LAND USE MEASURES TO HELP PREVENT FLOOD HAZARDS AND LOSSES IN FLOOD PLAIN AREAS.
For primary bibliographic entry see Field 6F.
W76-05237

AMENDMENTS TO BUILDING CODE TO PREVENT FLOOD HAZARDS AND LOSSES.
For primary bibliographic entry see Field 6F.
W76-05238

PROPOSED FLOODPLAIN REGULATIONS FOR THE GREATER ANCHORAGE AREA BOROUGH.
Greater Anchorage Area Borough, Alaska. Planning Dept.
For primary bibliographic entry see Field 6F.
W76-05239

PERMITS FOR CONSTRUCTION BELOW HIGH WATER MARK.
South Carolina State Budget and Control Board, Columbia.
S. C. Code Ann., Vol. 17, Rules and Regulations, p. 138 (1974 Comm. Supp.). 1 p.

Descriptors: *South Carolina, *Legislation, *Construction, *High water mark, *Permits, Legal aspects, Ownership of beds, Excavations, Regulation, Water law,Water rights, Water quality, Water quality control, Navigable waters, Bed.

The state of South Carolina requires that a permit be obtained for any construction or excavation below the usual high water mark of all navigable waters within the state. All such permits shall be issued by the Division of General Services. (Nursey-Florida)
W76-05240

PROPOSED PENNSYLVANIA FLOOD DISASTER PREVENTION ACT.
For primary bibliographic entry see Field 6F.
W76-05241

SAMPLE ZONING REGULATIONS FOR THE MANAGEMENT OF FLOOD HAZARD AREAS.
For primary bibliographic entry see Field 6F.
W76-05242

MATSON V STATE (PLAT OWNERS ACQUISITION OF SUBSEQUENT ACCRETIONS).
531 p2nd 836-37 (Wash Ct App 1975). 2 p.

Descriptors: *Washington, *Accretion, *Coasts, *Beaches, *Boundaries(Property), Water, Water law, Legal aspects, Land, Land classification, Land forming, Boundary disputes, Legal review, Judicial decisons, Real property.
Identifiers: Coastal lands, Land ownership, Plats, Upland, Ocean front property.

Plaintiff landowner brought action against defendant original platter to quiet title to accreted lands along the Pacific Ocean. Plaintiff asserted his title by reason of ownership of platted property derived through conveyances from the original platter. Defendant contended that the existence of a creek in the original plat, located between plaintiff's land and the ocean, established the existence of upland between plaintiff's tract and the ocean. The Court of Appeals of Washington stated the applicable rule to be that, if at the time it was recorded the plat extended to the water's edge, the owners of the tracts facing the ocean acquire title to subsequent accretions. However, if a strip of uplands existed between the platted property and the water's edge, title to subsequent accretions is acquired by the owner of the intervening uplands. The court affirmed a judgment for plaintiff, ruling that there was sufficient evidence to support the trial court's conclusion that the overall design of the plat was such as to give beach property to the purchasers, and that the existence of the creek in the original plat did not preclude this result. (Schilling-Florida).
W76-05243

CLEARING UP THINKING ON POLLUTION LAWS,
For primary bibliographic entry see Field 5G.
W76-05316

THE GENESIS AND FUNCTION OF THE FOURTH WATER RESOURCES COUNCIL ACCOUNT,
Office of the Chief of Engineers (Army), Washington D. C. Civil Works Directorate.
For primary bibliographic entry see Field 6B.
W76-05355

GOVERNMENT AGENCY EFFORTS IN QUALITY OF LIFE IMPACTS,
Cornell Univ., Ithaca, N.Y. Water Resources and Marine Sciences Center.
For primary bibliographic entry see Field 6B.
W76-05356

THE POLITICS OF INFORMATION: THE SOCIAL WELL-BEING OBJECTIVE,
Arizona Univ., Tucson. Dept. of Government.
For primary bibliographic entry see Field 6B.
W76-05359

PUBLIC PARTICIPATION IN WATER AND WASTE WATER PLANNING,
Clemson Univ., S. C. Dept. of Environmental Systems Engineering.
For primary bibliographic entry see Field 6B.
W76-05371

REPORT OF THE ANNUAL YIELD OF THE ARKANSAS RIVER BASIN FOR THE ARKANSAS RIVER BASIN COMPACT, ARKANSAS--OKLAHOMA,
Geological Survey, Little Rock, Ark.
For primary bibliographic entry see Field 4A.
W76-05416

INTERNATIONAL EXTERNALITIES AND OPTIMAL TAX STRUCTURES,
University of Western Ontario, London.
For primary bibliographic entry see Field 5G.
W76-05446

IMPACT OF THE SAFE DRINKING WATER ACT,
Environmental Protection Agency. Washington, D. C.
For primary bibliographic entry see Field 5G.
W76-05449

STATE REGULATORY AGENCIES AND THE SAFE DRINKING WATER ACT,
New Jersey Dept. of Environmental Protection, Trenton, N. J. Bureau of Potable Water.
For primary bibliographic entry see Field 5G.
W76-05450

MANAGEMENT OF WATER QUALITY THROUGH SELECTED INSTITUTIONS AND INSTRUMENTS,
Iowa State Univ., Ames. Dept. of Economics.
For primary bibliographic entry see Field 5G.
W76-05453

THE STATUS OF WATER POLLUTION CONTROL IN THE SOVIET UNION, (FIRST PART),
Crown Zellerbach Corp., Camas, Wash. Environmental Services Div.
For primary bibliographic entry see Field 5D.
W76-05483

THE STATUS OF WATER POLLUTION CONTROL IN THE SOVIET UNION, (SECOND PART),
Crown Zellerbach Corp., Camas, Wash. Environmental Services.
For primary bibliographic entry see Field 5D.
W76-05484

WATER RESOURCES DEVELOPMENT IN THE TISZA RIVER BASIN AND ITS IMPACT ON SOCIO-ECONOMIC GROWTH,
Water Management Center, Budapest (Hungary). Dept. of Long Range Planning.
For primary bibliographic entry see Field 4A.
W76-05519

6F. Nonstructural Alternatives

AN ENGINEERING EMERGENCY: THE 1974 FLOODS,
Brisbane City Council (Australia). Dept. of Water Supply and Sewerage.
For primary bibliographic entry see Field 4A.
W76-05059

NEBRASKA FLOOD PLAIN REGULATIONS ACT.
Nebraska Rev. Stat., Sec. 2-1506.01 through 2-1506.14 (Supp. 1967), amended by laws 1969, Chapter 18, page 172. 7 p.

Descriptors: *Nebraska, *Flood control, *Floodways, *Obstruction to flow, *Permits, Water courses(Legal aspects), Channels, Beds, Flood plains, Dams, Walls, Embankments, Levees, Dikes, Conduits, Culverts, Gradation, Maintenance, Investigations, Surveys, Repairing, Appropriation, Expenditures, Navigable waters.
Identifiers: *Floodway-encroachment lines, *Artificial obstructions, *Natural obstructions, drainways, Public nuisance.

The Nebraska Flood Plain Regulations Act provides that floodway-encroachment lines are to be established along watercourses and drainways to minimize the extent of floods. The State Natural Resources Commission shall gather data to reasonably locate floodways throughout the state, including floodways for floods of the one hundred year frequency, and shall establish floodway-encroachment lines for such floodways within which a political subdivision may establish land-use regu-

lation. Any artificial obstructions within any floodway is declared a public nuisance unless authorized by permit. The Commission is authorized to issue such permits to make artificial obstructions lawful. Any person who locates or maintains an artificial obstruction without a permit shall be guilty of a misdemeanor. Under certain conditions the Commission has the power to remove natural obstructions and to make reasonable entry onto lands and waters in the state. The Commission also has the power to issue orders and rules to implement this act. The State Treasurer is directed to establish the Floodway Obstructions Removal Fund. Permits granted under this act in no way affect other permits required by the state, political subdivisions, or the United States. (Segall-Florida)
W76-05224

REGULATION OF CONSTRUCTION WITHIN FLOOD PLAINS ESTABLISHED PURSUANT OF SECTION 65F, CHAPTER 19, ILLINOIS REVISED STATUTES.
Illinois, Department of Transportation, Rules and Regulations (Feb. 18, 1975). 21 p.

Descriptors: *Flood plain zoning, *Illinois, *Flood plains, *Flood control, *Construction, Floods, Roads, Sedimentation, Encroachment, Flood stages, Structures, Landfills, Storage, Floodwater, Permits, Channels, Floodproofing, Drainage, Levees, Safety, Flood protection, Flood damage.
Identifiers: Flood fringe, Flood protection elevation, Encroachment limit, Hydraulic analysis, Floodwalls, Water surface profile, Conveyance, Inundation, Improvements.

Illinois has enacted regulations the purpose of which is to protect the public health, safety, and general welfare by restricting flood plain improvements and uses which increase flood damage potential elsewhere. Representative provisions include the following: (1) all construction shall be unlawful if undertaken on the regulatory flood plain, as defined by these regulations, without a permit from the Department of Transportation; (2) permits will ordinarily be granted for construction which does not have significant flood damage potential; (3) a wide range of uses may be permitted in the flood fringe providing such uses are protected to the regulatory flood protection elevation; (4) acceptable methods for providing flood protection include permanent landfills, elevated structures, and structural floodproofing; and (5) temporary fills are permitted if the permittee assumes full liability for flood damage caused by the existence of the temporary fill. Other provisions regulating state flood plains are set forth. (Segall-Florida)
W76-05225

CHANGES IN 1972 COLUMBUS CITY CODE (FLOOD HAZARD ORDINANCE.)
Columbus, Ohio, Ord. No. 835-72 and 847-72 (1972). 7 p.

Descriptors: *Permits, *Floodways, *Building codes, *Flood control, Flood protection, Encroachment, Flood plains, Floods, Streams, Channels, Floodproofing, Flood damage, Structures, Buildings, Food profiles, Safety, Landfills, Water coursesLegal aspects). Rivers, Obstruction to flow, Ohio.
Identifiers: Floodway fringe, Recurrence interval, Flood protection, Inundation, Flood surface elevations, Anchoring.

The purpose of this ordinance is to promote the general welfare of Columbus, Ohio, by lessening flood damage. The floodway is defined to be the channel of a water-course and the adjacent area required to carry and discharge the waters resulting from the 100-year recurrence interval flood. The area chosen for the floodway must be designed to carry the waters of the 100-year flood without increasing the water surface elevation of that flood more than one foot. Within a floodway, buildings and premises can only be put to specified uses, and structures built in the floodway must meet specified requirements. No building or premises in the floodway shall be used for overnight accommodations by human inhabitants. Structures and premises within the floodway fringe must meet zoning specifications. No structure or premises which encroaches upon the abutting floodway shall be used in the floodway fringe. Within a floodway or floodway fringe, no structures shall be erected or altered except upon the issuance of a Certificate of Zoning Clearance. Regulations governing building permit applications and structural requirements are also set forth. (Segall-Florida)
W76-05226

MODEL FLOOD PLAIN ZONING ORDINANCE (OHIO),
Mid-Ohio Regional Planning Commission, Columbus.
H. T. Merwin, T. Richardson, and R. J. Holland.
June 1972, 23 p.

Descriptors: *Ohio, *Flood plain zoning, *Land use, :Flood protection, *Pemits, Floods, Hazards, Safety, Public healh, Structures, Channels, Flood stages, Encroachment, Streams, Flood frequency, Floodways, Floodproofing, Obstruction to flow, Dams, Rivers, Reach(Streams), Maps, Regional flood, Agriculture, Recreation facilities.
Identifiers: *Flooodway fringe, water surface profile, Inundation.

The purpose of this Model Flood Plain Zoning Ordinance is to provide a guide for the adoption of local flood plain ordinances and regulations. It provides for issuance of an Official Zoning Map, which together with other documents, will delineate the landward limits of the Regulatory Flood Plain District. It establishes permitted, prohibited, and conditional uses in the Regulatory Flood Plain Distric t, and conditional uses in the floodway fringe, including flood control works. Conditions are also established for the continued use of structures which were lawful before adoption of the ordinance, but which are not in conformity with its requirements. Permits are required prior to erection or alteration of any structure and prior to a change of use of any structure.Conditions and procedures for application and issuance of such permits, including provisions for public hearings and appeals, are set forth, and flood proofing measures as a condition for issuance of a permit are described Finally, provisions are made for amending zoning maps and for penalties for violation of the ordinance. (Segall-Florida)
W76-05227

A THREE-DIRECTIONAL APPROACH TO FLOOD PLAIN MANAGEMENT, MINNESOTA EXPERIENCES,
Minnesota Dept. of Natural Resources, St. Paul.
J. M. Wright.
Paper presented at National Conference on Flood Plain Management, Washington, D. C. (July 24, 1974). 25 p, 5 fig.

Descriptors: *Minnesota, *Flood damage,*Build ing codes, *Flood plin zoning, Land use, Flood control, Streams, Lakes, Rivers, Water supply, Flood flow, Rainfall, Snowmelt, Floods, High water mark, Maps, Floodways, Buildings, Encroachment, Permits, Structures, Safety, Public health, Waste disposal, Floodproofing, Flood plain insurance, Flood protection.
Identifiers: *Flood plain management, Floodway fringe, Flood protection elevation.

Minnesota, a water-rich state, has suffered much flood damage in the past. In 1969 Minnesota enacted the Flood Plain Management Act in an effort to minimize future flood damage. The Act required all counties and cities to adopt flood plain management provisions within six months after sufficient data became available to define flood hazard areas. The Act provides for detailed investigation and collection of flood management data. The objectives of the flood plain regulations are to restrict dangerous land uses at time of construction, and to protect against flood damage in times of flood. Zoning ordinances, subdivision regulations, building codes that incorporate floodproofing regulations, and sanitary regulations are all used to achieve these objectives. Other measures, including participation in the National Flood Insurance Program, are suggested to supplement these controls. Under the Act the Department of Natural Resources has played an active role, cooperating with local governmental units, other state agencies, and federal agencies in collecting data and providing information on flood plan management. Maps and diagrams are included. (Segall-Florida)
W76-05228

ORDINANCE AMENDING SECTION 7-1 AND 7-2 OF ARTICLE 1 OF THE COLLIER COUNTY BUILDING CODE (FLOOD PLAIN AND COASTAL CONSTRUCTION).
Collier County, Florida, Draft Ordinance to Amend Section 7-1 and 7-2 (April 5, 1974). 4 p.

Descriptors: *Building codes, *Florida, *Flood plains, *Land development, Land use, Construction, Buildings, Permits, H
Identifiers: *Federal Flood Insurance Program.

Collier County, Florida has adopted an ordinance amending the county building code to regulate construction within the flood plain. Representative provisions include: (1) it shall be unlawful to erect any building in flood hazard areas unless constructed in accordance with the requirements established by this ordinance; (2) land within coastal high-hazard areas below the level of the one hundred year flood shall not be developed except as provided in this ordinance; (3) applications for a variance from the provisions of the ordinance shall be accompanied by a survey, and written notices shall be given to applicants; (4) all applications for building permits for new construction or substantial improvements within the flood plain area having special flood hazards must be reviewed to assure that protection against flood damage is provided for; and (5) violation of any provision of this ordinance is a misdemeanor. The purpose of these and other provisions of the new ordinance is to enable Collier County to qualify for subsidized flood insurance under the Federal Flood Insurance Program. (Segall-Florida)
W76-05230

AN ORDINANCE RELATING TO DRAINAGE AND FLOOD CONTROL.
For primary bibliographic entry see Field 6E.
W76-05234

FLOOD CONTROL AND FLOOD WATER CONSERVATION.
For primary bibliographic entry see Field 6E.
W76-05235

AN ORDINANCE AMENDING THE GREENSBORO CODE OF ORDINANCES WITH RESPECT TO ZONING.
City Council, Greensboro, North Carolina, Chapter 23, art. 1X (1971).16, p 2 fig.

Descriptors: *North Carolina, *Flood plain zoning, *Water zoning, *Land use, *Public health, Legislation, Regulation, Nonstructural alternatives, Permits, Maps, Flood protection, Legal aspects, Water policy, Administration, Management, Comprehensive planning, Flood damage.
Identifiers: *Flood hazard areas, Administrative procedures.

The City Council of Greensboro, North Carolina, has adopted an ordinance designed to regulate development within flood hazard areas in order to prevent property damage, injuries and loss of life. As a first step in achieving the goal, the ordinance presents a method which can be used to analyze flood hazard areas. Once this has been done, areas within the zoning jurisdiction of the ordinance are divided into three zones, based upon the probability of floods within the areas. These zones are the floodway zone, floodway fringe zone, and upland zone. Land uses within the floodway and floodway fringe zones are regulated by the ordinance, which presents a list of permitted uses applicable to each zone. These land use regulations will be enforced mainly through a certificate of compliance and permit system under the control of the building inspector. For unusual cases, an administrative procedure is provided which must be followed by individuals seeking a special exception from floodway fringe zone development regulations. In a related action, the ordinance adopts a specified U. S. Army Corps of Engineers Map Series as the Official Flood Zoning Map. (Hoffman-Florida)
W76-05236

LAND USE MEASURES TO HELP PREVENT FLOOD HAZARDS AND LOSSES IN FLOOD PLAIN AREAS.
Board of Directors, Fort Smith, Arkansas, Ordinance to Help Prevent Flood Hazards and Losses, May, 1973. 5 p.

Descriptors: *Arkansas, *Local governments, *Building codes, *Floods, *Flood plain zoning, *Water law, Legal aspects, Regulation, Governments, Waterproofing, Flood plains, Floodproofing, Flood control, Flood damage, Flood water, Flood protection,Maximum probable flood, Legislation.

The City of Fort Smith, Arkansas, has enacted an ordinance to help prevent and alleviate flood hazards and losses in flood plain areas. Ordinance regulations apply to all existing and proposed construction and all filling operations lying within and below the projected 100-year frequency flood plain elevation, New residential structures or additions thereto shall have the lowest habital floor, including basements, elevated to or above the level of the 100-year flood. Regulations are included concerning the design, construction methods, and construction materials of non-habital floor levels and detached utility buildings. New non-residential structures or additions thereto shall have the lowest floor elevated to or above the level of the 100-year flood, or shall be flood proofed up to the level of the 100-year flood. Structures in existence which would be prohibited by this ordinance may be repaired or altered only by use of construction methods and materials which will minimize flood damage. In riverine situations, no use may be permitted which would increase the surface elevation of the 100-year flood more than one foot at any point. With respect to subdivisions or other new developments, proposals shall meet standards set forth in this ordinance. Water supply systems and/or sanitary sewer systems shall be designed to minimize infiltration of flood water and discharge from the systems into flood waters. (Schilling-Florida)
W76-05237

AMENDMENTS TO BUILDING CODE TO PREVENT FLOOD HAZARDS AND LOSSES.
Fayetteville, Arkansas, Ordinance 2018 (1974). 4 p.

Descriptors: *Arkansas, *Local government, *Legislation, *Floods, *Flood plain zoning, Water, Water law, Legal aspects, Regulation, Governments, Waterproofing, Flood plains, Floodproofing, Flood control, Flood damage, Flood water Flood protection, Building codes, Maximum probable flood, Penalties(Legal).

The City of Fayetteville, Arkansas, has amended the city building code for all existing and proposed construction and all land filling and excavation operations lying within and below the projected 100-year frequency flood plain elevation. Included are regulations concerning construction of and additions, repairs, or alterations to existing residential and non-residential structures. These provisions regulate floor elevation, flood proofing, and construction design, materials, and methods. For example, water supply systems and sanitary sewer systems shall be designed to minimize infiltration of flood waters or discharge into flood waters. With respect to subdivisions or other new developments, proposals shall be consistent with the need to minimize flood damage; public utility facilities shall be located and constructed to minimize or eliminate flood damage; and adequate drainage shall be provided. No land use, including land fill and excavation, may be permitted within the flood plain area unless it is demonstrated that such use, combined with all other existing and anticipated uses, will not increase the surface elevation of the 100-year flood more than one foot at any point. Within the flood plain area, laws and ordinances concerning land use and flood damage reduction shall take precedence over any conflicting law, ordinance, or code. (Schilling-Florida)
W76-05238

PROPOSED FLOODPLAIN REGULATIONS FOR THE GREATER ANCHORAGE AREA BOROUGH.
Greater Anchorage Area Borough, Alaska. Planning Dept.
Proposed Floodplain Regulations, May, 1972. 33 p.

Descriptors: *Alaska, *Local governments, :Legislation, *Floods, *Flood plain zoning, Water law, Legal aspects, Regulation, Governments, Waterproofing, Flood plains, Floodproofing, Flood control, Flood damage, Floodwater, Flood protection, Building codes, Maximum probable Flood, Permits.
Identifiers: Fill permits.

This ordinance applies to all lands which are located within the boundaries of the 100-year flood within the Greater Anchorage Area Borough. This area is designated the Flood Hazard District. Within the Flood Hazard District, uses involving structures, fill, or storage yards are permitted only upon the issuance of a special land hazard permit. Procedures for the issuance of such permits, as well as the factors upon which the issuance decision shall be based, are included in this ordinance. No use may be permitted which will substantially increase flood heights. To deposit fill in the flood hazard district, it must be shown that it is the minimum amount necessary, and that adequate precautions are taken to prevent erosion. Structures shall be designed to have a low flood damage potential, and shall be constructed, located, and anchored incompliance with this ordinance. Storage or processing of unanchored buoyant materials, or materials that are flammable, explosive, or dangerous to life in times of flooding is prohibited. Structures or uses which do not conform to this ordinance may be continued under conditions set forth in this ordinance. Variances from the provisions of this ordinance may be granted under certain circumstances. (Schilling-Florida)
W76-05239

PROPOSED PENNSYLVANIA FLOOD DISASTER PREVENTION ACT.
Pennsylvania, General Assembly, Harrisburg, Senate Bill No. 1 (1975).31 p.

Descriptors: *Pennsylvania, *Legislation, *Flood control, *Flood plain zoning, *Standards, Legal aspects, Law enforcement, Penalties(Legal), Permits, Regulation, Water law, State governments, Local governments, Flood protection, Water policy, Water management(Applied), Land use, Land development, Land resources, Water resources, Water utilization, Building codes, Floods,Water resources development.
Identifiers: *Pennsylvania Flood Disaster Prevention Act, Administrative regulations.

This proposed bill provides for the regulation of land and water use for flood control purposes, imposes duties and confers powers on various state administrative departments, provides for enforcement and penalties, and makes an appropriation. After a 'definition of terms' section, the Act provides that the Environmental Quality Board shall have the power to adopt regulations to require comprehensive flood area management and to establish minimum standards for delineation of flood areas. Representative provisions include: (1) design, construction and maintenance standards for obstructions within each flood area zone; (2) procedures for issuance of flood area construction permits; and (3) designation by municipalities of the county or regional planning agency as its agent for the development of the flood area management plan. Other sections provide for inter-agency cooperation, advisory consultative services, publication of results, and assessment of penalties. Finally, the Department of Community Affairs is authorized to administer grants to municipalities and counties to assist or reimburse them for costs incurred in complying with this bill. (Nursey-Florida).
W76-05241

SAMPLE ZONING REGULATIONS FOR THE MANAGEMENT OF FLOOD HAZARD AREAS.
Regulations of the Vermont Agency of Environmental Conservation, Montpelier, (1974). 17 p 2 fig, 1 apend.

Descriptors: *Vermont, *Legislation, *Flood control, *Flood protection, Construction, Legal aspects, Floodways, Flood plain zoning, Floods, Flood damage, Water management(Applied), Water law, Local governments, Regulation, Building Codes, Water resources, Water resources development, Water supply, Drainage systems, Land, Land use, Land development.
Identifiers: *National Flood Insurance Program, *Flood hazard areas.

As part of its program encouraging local governments to manage flood prone lands so as to qualify for federal flood insurance, the General Assembly of Vermont has provided sample zoning regulations, representative provisions of which include: (1) no land development is allowed within a flood hazard area without the approval of the Board of Adjustment (2) residential buildings in the floodway fringe must have the lowest floor elevated to at least one foot above the 100-year flood level; (3) non-residential buildings within the floodway fringe must have the lowest floor elevated or floodproofed to at least one foot above the 100-year flood level; (4)structures must be designed and anchored to prevent flotation, collapse or lateral movement; (5) water supply and sewage systems must be designed and located to avoid impairment or contamination during flooding; (6) junkyards and solid waste disposal sites are not permitted within a flood hazard area; (7) buildings and uses which existed prior to the effective date of this regulation may be continued indefinitely but shall not be altered without the approval of the planning commission and (8) permits authorized under this regulation may be appealed by interested parties. Addenda to the sample regulations include an illustration of definitions for flood hazard areas. (Nursey-Florida)
W76-05242

FLOOD PLAIN INFORMATION: FARMINGTON AND CONNECTICUT RIVERS, WINDSOR, CONNECTICUT.
Army Engineer District, Waltham, Mass.
For primary bibliographic entry see Field 4A.
W76-05256

FLOOD PLAIN INFORMATION: WEST BRANCH DUPAGE RIVER, KRESS CREEK, AND KLEIN CREEK, DUPAGE COUNTY, ILLINOIS.
Army Engineer District, Chicago, Ill.
For primary bibliographic entry see Field 4A.
W76-05257

SPECIAL FLOOD HAZARD INFORMATION: DUNN BRANCH, WOODBINE, GEORGIA.
Army Engineer District, Savannah, Ga.
For primary bibliographic entry see Field 4A.
W76-05258

THE TRI-STATE COASTAL ZONE MANAGEMENT PERSPECTIVES.
Tri-State Regional Planning Commission, New York.
For primary bibliographic entry see Field 6G.
W76-05260

SPECIAL FLOOD HAZARD INFORMATION: ARKANSAS RIVER AND WILD HORSE CREEK, HOLLY, COLORADO.
Army Engineer District, Albuquerque, N. Mex.
For primary bibliographic entry see Field 4A.
W76-05262

FLOOD PROOFING DECISIONS UNDER UNCERTAINTY,
Massachusetts Univ., Amherst Dept. of Agricultural and Food Economics.
C. E. Willis, and P. Aklilu.
Available from the National Technical Information Service, Springfield, Va 22161, as PB-251 045, $3.50 in paper copy, $2.25 in microfiche. (1974) 15 p. 2 fig, 1 tab, 19 ref.OWRT B-028-MASS (2).

Descriptors: *Risks, *Decision making, *Floodproofing, Methodology, Flood protection, Cost-benefit analysis, Estimating, *Connecticut, *Connecticut River.
Identifiers: Windsor(Conn).

A formulation for estimating the economic efficiency of flood proofing in a partial equilibrium context for specific communities in the Connecticut River Basin is developed. The advantages of explicitly incorporating uncertainty factors into the analysis are discussed and illustrated empirically. Incorporating risk factors into the decision making process, while requiring more complicated procedures, yields more correct and less ambiguous results. Applying the expectation-variance framework to the case of the Windsor, Connecticut community, the recommend decision is to floodproof structures to a height of four feet when the discount rate is 5% over fifty years and the increased expected benefits are at least 3.4 times as valuable as reduced standard deviation of net benefits. Major limitations of the method include assuming that benefits or damage reductions and flood proofing costs are linear in terms of the depth of the flood, and assuming that the only alternatives are to flood proof to various levels or do nothing, rather than considering a mix of structural and non-structural measures. (Luedtke-Wisconsin)
W76-05456

6G. Ecologic Impact Of Water Development

ROOKERY BAY LAND USE STUDIES, ENVIRONMENTAL PLANNING STRATEGIES FOR THE DEVELOPMENT OF A MANGROVE SHORELINE, STUDY NO. 3, ESTUARINE WATER QUALITY,
Conservation Foundation, Washington, D. C.
For primary bibliographic entry see Field 5G.
W76-05005

ROOKERY BAY LAND USE STUDIES, ENVIRONMENTAL PLANNING STRATEGIES FOR THE DEVELOPMENT OF A MANGROVE SHORELINE, STUDY NO. 5, ESTUARINE BIOLOGY,
Conservation Foundation, Washington, D. C.
For primary bibliographic entry see Field 5G.
W76-05006

ROOKERY BAY LAND USE STUDIES, ENVIRONMENTAL PLANNING STRATEGIES FOR THE DEVELOPMENT OF A MANGROVE SHORELINE, STUDY NO. 7, POLICY AND REGULATORY DIMENSIONS,
Conservation Foundation, Washington, D. C.
For primary bibliographic entry see Field 5G.
W76-05007

ROOKERY BAY LAND USE STUDIES, ENVIRONMENTAL PLANNING STRATEGIES FOR THE DEVELOPMENT OF A MANGROVE SHORELINE, STUDY NO. 9, PRINCIPLES OF ECOSYSTEM MANAGEMENT,
Conservation Foundation, Washington, D.C.
For primary bibliographic entry see Field 5G.
W76-05008

ROOKERY BAY LAND USE STUDIES, ENVIRONMENTAL PLANNING STRATEGIES FOR THE DEVELOPMENT OF A MANGROVE SHORELINE, STUDY NO. 10, GROWTH AND LAND USE, STUDY NO. 11, ECONOMIC IMPLICATIONS OF LAND DEVELOPMENT ALTERNATIVES, STUDY NO. 12, A SIMULATION MODELING APPROACH TO THE STUDY OF DEVELOPMENT ALTERNATIVES,
For primary bibliographic entry see Field 5G.
W76-05009

CRITERIA FOR THE ECOLOGICAL EVALUATION OF THE LOWER MAIN RIVER, (IN GERMAN),
Natur-Museum und Forschungs-Institut Senchkenber, Frankfurt am Main (West Germany).
For primary bibliographic entry see Field 5B.
W76-05057

THE ENVIRONMENTAL IMPACT OF AN OFFSHORE OIL SPILL,
Chevron Oil Field Research Co., La Habra, Calif.
For primary bibliographic entry see Field 5C.
W76-05148

PROTECTING PUBLIC HEALTH FROM HAZARDOUS SUBSTANCES: FEDERAL REGULATION OF ENVIRONMENTAL CONTAMINANTS,
Environmental Law Inst. Washington, D.C.
M. L. Karstadt.
Environmental Law Reporter, Vol. 5, No. 9, p. 50165-50178 (1975), 14 p.

Descriptors: *Regulation, *Public health, *Hazards, *Pollutants, *Water quality control, Legal aspects, Federal government, Judicial decisions, Organizations, Diseases, Toxicity, Industrial wastes, Pesticide residues, Water pollution sources, Water pollution effects, Water pollution control, Air pollution, Potable water, Legislation, Legal review, Water law, Industries, Wastes.
Identifiers: Administrative regulations, Hazardous substances.

Protection of the public from possible harm caused by the release of hazardous substances into the environment is largely the responsibility of various federal regulatory agencies whose decisions are often hampered by insufficient data. When a possible public health threat arises, coupled with an incomplete data base, regulators must be biased in favor of measures which will reduce exposure of humans to potentially hazardous substances. The problems faced by regulators in the field of environmental health regulation are exacerbated by the fact that many courts will not uphold regulations prohibiting the use of potentially hazardous substances unless a substantial threat of harm to public health can be shown. Since most scientific data is accumulated through tests on animals and there is rarely human data available, it is often extremely difficult to show the substantial threat of harm required. With the rapid pace of technological innovation in American society, the only possible solution to the problem may be to require industry to bear the burden of demonstrating the safety of its new products and processes before significant human exposure occurs. (Nursey-Florida)
W76-05185

ENVIRONMENTAL PROTECTION AND THE ROLE OF THE CIVIL MONEY PENALTY: SOME PRACTICAL AND LEGAL CONSIDERATIONS,
D. W. Marshall.
Environmental Affirs, Vol. 4 p. 323-366 (1975), 44 p.

Descriptors: *Costs, *Industries, *Penalties(Legal), *Water pollution control, *Law enforcement, Environmental effects, Legal aspects, Judicial decisions, Legislation, State governments, Federal government, Governments, Pollutants, Negligence, Regulation, Water law, Economics, Water pollution sources, Water pollution effects, Water pollution abatement, Water quality, Water quality control, Constitutional law.
Identifiers: *Civil money penalties, Environmental policy, Injunctive relief.

Injunctions possess negligible deterrent value in the enforcement of environmental legislation. And while criminal sanctions may be an effective deterrent to wilful violations of environmental laws, they are inappropriate for the bulk of environmental violations, which are often due to negligence. Thus the civil money penalty fills a great need by operating as an effective general deterrent to environmental law violations. The civil penalty has for its major premise that, where the penalty is greater than the polluter's cost of abatement, the polluter will choose to comply with the law rather than pay the penalty. The penalty is thus designed to reduce environmental pollution, not to punish violators. To assure its effectiveness, the civil penalty must be administered in a manner calculated to achieve maximum flexibility, with measures tailored to fit the particular situation. (Nursey-Florida)
W76-05188

ENVIRONMENTAL PROTECTION IN CALIFORNIA: COURT ACTION POWERS OF STATE AND LOCAL GOVERNMENT ATTORNEYS,
J. P. Wagner.
Santa Clara Lawyer, Vol. 14, p. 296-324 (1974), 29 p.

Descriptors: *California, *Law enforcement, *State governments, *Local governments, *Pollution abatement, Legal aspects, Air pollution, Air pollution effects, Water pollution, Water pollution sources, Water pollution effects, Water pollution abatement, Water quality, Water quality control, Pollutants, Public health, Governments, Governmental interrelations, Penalties(Legal), Environmental effects, State jurisdiction, Legislation, Judicial decisions, Water law.
Identifiers: *California Water Code, California Health and Safety Code, Nuisance(Legal aspects), Injunctive relief.

The California Attorney General possesses powers through his representation of state agencies, his involvement in state legal matters and his control over actions involving counties to bring en-

vironmental protection actions in the courts. Local government attorneys, however, have only limited powers in relatively few areas. These include certain powers derived from the representation of local agencies and districts, and the power to abate nuisances. They also possess some statutory air pollution control powers. If environmental protection is to be meaningful, the powers of local government attorneys must be greatly expanded and traditional equity requirements for injunctive relief greatly modified. (Nursey-Florida)
W76-05189

ENVIRONMENTAL CLASS ACTIONS IN THE FEDERAL COURTS - PEERING THROUGH THE ZAHN SMOG,
For primary bibliographic entry see Field 6E.
W76-05190

PERSPECTIVES ON THE ARMY ENGINEERS WATER MANAGEMENT MISSION,
Corps of Engineers, Washington, D.C.
For primary bibliographic entry see Field 6E.
W76-05211

MONTANA ENVIRONMENTAL POLICY ACT,
Montana Environmental Quality Council, Helena.
For primary bibliographic entry see Field 6E.
W76-05218

FEDERAL LEGISLATION AND COMMON LAW ASPECTS OF ENVIRONMENTAL PROBLEMS IN CANADA,
Atlantic Richfield Canada Ltd., Calgary (Alberta).
For primary bibliographic entry see Field 6E.
W76-05231

THE TRI-STATE COASTAL ZONE MANAGEMENT PERSPECTIVES.
Tri-State Regional Planning Commission, New York.
April 1975. 48 p 15 fig, 18 tab.

Descriptors: *Harbors, *Land use, *Shore protection, *Planning, *Area redevelopment, Rivers, Environmental effects, Water treatment, Projections, Recreation, Waste disposal, Hudson River, *Land management, Connecticut, New York, New Jersey.
Identifiers: Shipping, *Coastal zone management.

The goal of management in this region, composed of the states of CT, NJ and NY, is to accommodate the economic, cultural and leisure needs of the people requiring location in the coastal zone and to restore or enhance the natural character and functions of the zone. The report covers the status of this water-related area at present and problems and perspectives concerning the marine complex, recreation, power generation, shipping, waste disposal, land development, and managing the zone. The zone, which stretches over 1200 miles, has a significant amount of residential, nonresidential and recreation land uses as well as extensive harborfront which is making the transition from purely industrial uses. Almost 40% of the zone is still open and even the harbor is 1/3 undeveloped or in transition. Four strategies are recommended: establish strict site regulations for activities seeking location in the zone; reserve certain areas for heavy uses that need water-oriented location such as shipping, sewage treatment and power generation; encourage the combination of recreation, open space, scenic amenity, etc., with necessary economic 'heavy' uses; and set environmental tolerance standards. An administrative mechanism should be set up that can administer regulations, control development, resolve conflicts, and acquire land and water. Statistics are given on the various areas of concern. Considerations are broad. For example, with regard to power generation energy sources such as the sun, fuel cells, nuclear fusion, geothermal energy and wind power are considered. (Smith-North Carolina)
W76-05260

STRATEGY OF BIOLOGICAL MONITORING, (IN RUSSIAN),
For primary bibliographic entry see Field 5A.
W76-05301

ENVIRONMENTAL ANALYSIS OF WATER RESOURCES DEVELOPMENT IN SOUTHWESTERN NORTH DAKOTA,
Dickinson State Coll., N. Dak.
E. R. Logan.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-250 887, $5.00 in paper copy, $2.25 in microfiche. OWRT-A-041-NDAK (3) 14-31-0001-4034 5034 North Dakota Water Resources Research Institute, Fargo, Completion Report No. WI-221-034-76, February 1976. Part II, 86 p, 27 tab, append.

Descriptors: *North Dakota, Water resources development, *Vegetation, Plant groupings, *Bird types, *Fish types, *Mammal groupings, Environment.
Identifiers: Southwestern North Dakota.

A total of 20 vegetative community types were identified. Abstracts of the community descriptions are included. The abstracts are from published, unpublished and observational data. The community types included gravel bottom, mud bottom, submergent, floating leaved, reed swamp, sedge-meadow, sloughgrass, switchgrass-Canada wildrye, big bluestem, willow-cottonwood, wolfberry-rose-bromegrass, elm-boxelder, sagebrush, buffaloberry, green ash, aspen, juniper, ponderosa pine, salt desert shrub and sand dune. Total of 109 bird species were identified. Seventeen mammal species were observed and identified as well as several fish species. (See also W76-05350 and W76-05352)
W76-05351

THE SOCIAL WELL-BEING AND QUALITY OF LIFE DIMENSION IN WATER RESOURCES PLANNING AND DEVELOPMENT.
Utah State Univ., Logan. Inst. for Social Science Research on Natural Resources.
For primary bibliographic entry see Field 6B.
W76-05354

WESTERNPORT BAY ENVIRONMENTAL STUDY 1973-1974.
Victoria Ministry for Conservation, Melbourne (Australia). Westernport Bay Environmental Study.
1975. 647 p.

Descriptors: *Baseline studies, *Regional development, *Environmental effects, *Australia, *Bays, Estuaries, Watersheds(Basins), Economic impact, Social impact, Wildlife habitats, Recreation facilities, Comprehensive planning, Water quality, Land use, Model studies.
Identifiers: *Westernport Bay(Vic.).

The Westernport Bay area of southern Victoria (Australia) provides an important wildlife habitat and recreation facility; it also has features desirable for industrial port development. The Westernport Bay Environmental Study was initially a two-year study to develop guidelines for the future management of the area based on fundamental and extensive understanding of its physical, chemical, biological, social and economic characteristics. The first major report summarises the results of all projects within the Study and provides preliminary guidelines. It also places emphasis on the methodology developed for a multi-disciplinary approach to a complex environmental problem, particularly the incorporation of Water Quality and Land Activities models. (CSIRO)
W76-05404

A METHOD FOR APPLYING RESEARCH TO ENVIRONMENTAL PLANNING AND MANAGEMENT: A CASE STUDY OF ISSUES IMPORTANT TO THE CHESAPEAKE BAY REGION,
Center for the Environment and Man, Inc., Hartford, Conn.
For primary bibliographic entry see Field 6B.
W76-05434

7. RESOURCES DATA

7A. Network Design

COMPARISON OF ELECTROMAGNETIC AND SEISMIC-GRAVITY ICE THICKNESS MEASUREMENTS IN EAST ANTARCTICA,
Scott Polar Research Inst., Cambridge (England).
For primary bibliographic entry see Field 7B.
W76-05382

AN ASSESSMENT OF EUTROPHICATION IN AUSTRALIAN INLAND WATERS,
Department of Environment, Canberra (Australia).
For primary bibliographic entry see Field 5C.
W76-05405

7B. Data Acquisition

BIG-METER TESTING PROGRAM BOOSTS WATER REVENUES.
For primary bibliographic entry see Field 6C.
W76-05060

GREAT PLAINS EVAPOTRANSPIRATION BY A RESISTANCE MODEL USING REMOTELY SENSED THERMAL IMAGERY,
Nebraska Univ. Lincoln. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 2D.
W76-05179

SYMPOSIUM ON REMOTE SENSING IN GLACIOLOGY.
International Glaciological Society, Cambridge (England).
For primary bibliographic entry see Field 2C.
W76-05372

THE ELECTRICAL PROPERTIES OF SNOW AND ICE,
Birmingham Univ. (England). Dept. of Physics.
For primary bibliographic entry see Field 2C.
W76-05373

RADIO-ECHO SOUNDING: GLACIOLOGICAL INTERPRETATIONS AND APPLICATIONS,
Scott Polar Research Inst., Cambridge (England).
For primary bibliographic entry see Field 2C.
W76-05375

THEORY OF RADIO FROM GLACIER BEDS,
Bristol Univ. (England). H. H. Wills Physics Lab.
For primary bibliographic entry see Field 2C.
W76-05376

INVESTIGATIONS OF SUB-ICE BEDROCK CHARACTERISTICS BY RADIO-ECHO SOUNDING,
Scott Polar Research Inst., Cambridge (England).
For primary bibliographic entry see Field 2C.
W76-05377

GLACIER SLIDING MEASURED BY A RADIO-ECHO TECHNIQUE,
Scott Polar Research Inst., Cambridge (England). British Antarctic Survey, London (England).
For primary bibliographic entry see Field 2C.
W76-05378

LAYER ECHOES IN POLAR ICE SHEETS,
Technical Univ. of Denmark, Lyngby. Inst. of Electromagnetics.
For primary bibliographic entry see Field 2C.
W76-05379

RADIO-ECHO SOUNDING OF THE LAMBERT GLACIER BASIN,
Department of Sciences, Melbourne (Australia). Antarctic Div.
For primary bibliographic entry see Field 2C.
W76-05380

ADVANCES IN GEOPHYSICAL EXPLORATION OF ICE SHEETS AND GLACIERS,
Wisconsin Univ., Madison. Dept. of Geology and Geophysics; Wisconsin Univ., Madison. Geophysical and Polar Research Center.
For primary bibliographic entry see Field 2C.
W76-05381

COMPARISON OF ELECTROMAGNETIC AND SEISMIC-GRAVITY ICE THICKNESS MEASUREMENTS IN EAST ANTARCTICA,
Scott Polar Research Inst., Cambridge (England).
D. J. Drewry.
In: Symposium on Remote Sensing in Glaciology; Proceedings of the third symposium on glaciology, Cambridge (England), September 16-20, 1974. Journal of Glaciology, Vol. 15, No. 73, p 137-150, 197. 2 fig, 10 tab, 41 ref.

Descriptors: *Glaciers, *Ice, *Measurement, *Antarctic, On-site investigations, Seismic studies, Gravity studies, Remote sensing, Radar, Navigation, Sounding, Borehole geophysics, Glaciology.
Identifiers: *Radio-echo soundings, *Ice thickness.

The errors involved in ice thickness determinations in Antarctica by seismic reflection shooting, gravity observations, and radio-echo sounding were briefly discussed. Relative accuracies of 3%, 7-10% and 1.5% have been suggested. Double checks of ice depths from radar sounding in east Antarctica indicated an internal consistency of measurement for this technique of less than 1%. Comparison of carefully executed seismic shooting and routine radio-echo sounding results against absolute ice thickness values from two deep core drilling sites showed no significant differences between these two remote methods (i.e., both are better than 1.5%). Over 60 comparisons were examined between radar ice thicknesses and oversnow measurements obtained on 8 independent traverses in east Antarctica. Three traverses exhibited consistently unacceptable results--U.S. Victoria Land Traverse II (southern leg), Commonwealth Transantarctic Expedition, and the U.S.S.R. Vostok to South Pole Traverse--which probably resulted from misinterpretation of 'noisy' seismograms. The remaining comparisons indicated mean differences, including some navigational uncertainty, of about 3% less than 8%, and 5% between radio-echo and (1) seismic, (2) gravity, and (3) gravity tied to seismic determinations, respectively. (See also W76-05372) (Sims - ISWS)
W76-05382

VELOCITY OF RADIO WAVES IN ICE BY MEANS OF A BORE-HOLE INTERFEROMETRIC TECHNIQUE,
Scott Polar Research Inst., Cambridge (England).
G. de Q. Robin.
In: Symposium on Remote Sensing in Glaciology; Proceedings of the third symposium on glaciology, Cambridge (England), September 16-20, 1974. Journal of Glaciology, Vol. 15, No. 73, p 151-159, 1975. 4 fig, 2 tab, 16 ref.

Descriptors: *Ice, *Electrical properties, *Radio waves, *Velocity, Firn, Electronic equipment, On-site investigations, Borehole geophysics, Measurement, Glaciers, Glaciology.

Radio waves of fixed frequency, which had passed through ice and firn from a transmitting antenna lowered down a bore hole, were monitored on the surface. By mixing the received signal with the fixed frequency, the beats which were produced as the antenna was lowered gave a value for the wavelength in ice at the depth of the antenna. This was multiplied by the frquency to give the velocity of radio waves in ice. Measurements averaged over 10 m and longer intervals were related to density values from bore holes in the same location. Results above 50 m were difficult to interpret, but at greater depths the velocities fitted a linear relationship between refractive index and density. A small extrapolation gave a velocity of radio waves in pure ice of 167.7 + or - 0.3 m/micro-second at -20 C. (See also W76-05372) (Sims -ISWS)
W76-05383

APPLICATION OF RADAR TECHNIQUES TO ICE AND SNOW STUDIES,
Communications Research Centre, Ottawa (Ontario).
D. F. Page, and R. O. Ramseier.
In: Symposium on Remote Sensing in Glaciology; Proceedings of the third symposium on glaciology, Cambridge(England), September 16-20, 1974. Journal of GLaciology, Vol 15, No 73, p171-191, 1975. 13 fig, 45 ref.

Descriptors: *Ice, *Snow, *Measurement, *Remote sensing, *Radar, Sounding, Electrical properties, Equipment, Electronic equipment, Glaciers, Glacilogy.
Identifiers: *Side-looking radar, Floating ice.

This paper presents an overview of the active microwave tools becoming available to the glaciologist with emphasis on recent radar developments as applied to floating ice. Sufficient theory is presented for the user to understand the techniques. Side-looking radar imagery is discussed using a number of examples resulting from the use of real and synthetic aperture, single and dual polarization. Recent studies of the microwave properties of ice and snow are reviewed, and are shown to be leading to significant advances in high-resolution radar techniques for accurate sounding of these materials. Remote sensing of fresh-water ice thickness is shown to be well established and operational, with smilar techniques feasible in the near future for sea ice. It is pointed out that both imaging and probing radars applied to studies of sea ice and snow usually must be used in association with data from other sensors. (See also W76-05372) (Sims - ISWS)
W76-05385

INTERPRETATION OF SLAR IMAGERY OF SEA ICE IN NARES STRAIT AND THE ARCTIC OCEAN,
Defence Research Establishment, Ottawa (Ontario).
M. Dunbar.
In: Symposium on Remote Sensing in Glaciology; Proceedings of the third symposium on glaciology, Cambridge (England), September 16-20, 1974. Journal of Glaciology, Vol. 15, No. 73, p 193-213, 1975. 15 fig, 10 ref.

Descriptors: *Sea ice, *Arctic, *Radar, *Remote sensing, Aircraft, Surveys, Ice, Ice cover, Equipment, Electronic equipment.
Identifiers: *Nares Strait, *Side-looking radar, Photo interpretation.

Sideways-looking airborne radar (SLAR) imagery of Nares Strait was obtained on three flights carried out in January, March, and August of 1973 by Canadian Forces Maritime Proving and Evaluation Unit in an Argus aircraft equipped with a Motorola APS-94D SLAR; the March flight also covered two lines in the Arctic Ocean, from Alert to the North Pole and from the Pole down the long. 4 deg. E. meridian to the ice edge at about lat. 80 deg N. No observations on the ground were possible, but some back-up was available on all flights from visual observations recorded in the air, and on the March flight from infrared line-scan and vertical photography. The interpretation of ice features from the SLAR imagery was discussed, and it was concluded that in spite of certain ambiguities the technique has great potential which will increase with improving resolution. Extent of coverage per distance flown and independence of light and cloud conditions make it unique among airborne sensors. (See also W76-05372) (Sims-ISWS)
W76-05386

SEA-ICE RECONNAISSANCE BY RADAR,
Hokkaido Univ., Sapporo (Japan). Inst. of Low Temperature Science.
T. Tabata.
In: Symposium on Remote Sensing in Glaciology; Proceedings of the third symposium on glaciology Cambridge (England), September 16-20, 1974. Journal of Glaciology, Vol. 15, No. 73, p 215-224, 1975. 9 fig, 10 ref.

Descriptors: *Sea ice, *Radar, *Remote sensing, *Data processing, Movement, Coasts, Ice, Ice cover, Surveys, Computers, Equipment, Electronic equipment.
Identifiers: *Japan, *Hokkaido(Japan).

To observe the distribution of pack ice off the coast of the Okhotsk Sea coast of Hokkaido, a radar network consisting of three radar stations was constructed during 1967-69. It covers an area about 70 km wide and 250 km long. The stations are remote-controlled by radio from the Sea Ice Research Laboratory and the information obtained is transmitted back to the laboratory and observed there. Radar has the great advantage of being able to make continuous observations of ice. Usually several special features can be seen on the radar screen, and they are used as markers for the observation of movement. It is ascertained that the average pattern of drift in this area is from north to south-east along the coast line and the ice field undergoes internal deformation during its drift. To get some information on the surface topography of ice from A-scope radar, the intensity of echo signals is classified into 16 steps by computer. To obtain the movement of an ice field from the numerical radar information, a modified two-dimensional cross-correlation method was tested. (See also W76-05372) (Sims-ISWS)
W76-05387

COMPARISON OF SEA-ICE TYPE IDENTIFICATION BETWEEN AIRBORNE DUAL-FREQUENCY PASSIVE MICROWAVE RADIOMETRY AND STANDARD LASER/INFRARED TECHNIQUE,
Naval Oceanographic Office, Washington, D.C.
S. G. Tooma, R. A. Mennella, J. P. Hollinger, and R. D. Ketchum Jr.
In: Symposium on Remote Sensing in Glaciology; Proceedings of the third symposium on glaciology, Cambridge (England), September 16-20, 1974. Journal of Glaciology, Vol. 15, No. 73, p 225-239, 1975. 11 fig, 8 ref.

Descriptors: *Sea ice, *Remote sensing, *Instrumentation, Aircraft, Ice, Arctic, Coasts, Infrared radiation, Microwaves, Measurement, Equipment.
Identifiers: *Greenland, Radiometers, Laser profilers.

During December 1973, the Naval Oceanographic Office (NAVOCEANO) and the Naval Research Laboratory (NRL) conducted a joint remote-sensing experiment over the sea-ice fields off Scoresby Sound on the east coast of Greenland using NAVOCEANO's RP3-A Birdseye aircraft, laser profiler, and infrared scanner, and NRL's 19-34 and 31.0 GHz nadir-looking radiometers. The objectives of this mission were: (1) to develop skills for interpreting sea-ice passive microwave data; (2) to expand, if possible, the two-category capability (multi-year ice and first-year ice) of passive microwave sensors over sea ice; (3) to compare two frequences (19 and 31 GHz) to determine which may be more useful in a scanning radiometer now under development at NRL; and (4) to determine the value of multi-frequency as compared to single-frequency study of sea ice. Five ice conditions - open water/new ice, smooth first-year ice, ridged first-year ice, multi-year ice, and a higher brightness temperature form of multi-year ice interpreted as second-year ice - were identifiable, regardless of weather conditions, by comparing the average of the two microwave brightness temperatures at the two frequencies with their difference. (See also W76-05372) (Sims-ISWS)
W76-05388

TEMPERATURE MEASUREMENT OF ICE AND WATER SURFACES IN THE NORTH WATER AREA USING AN AIRBORNE RADIATION THERMOMETER,
Eidgenossische Technische Hochshule, Zurich (Switzerland). Geographisches Institut.
F. Muller, H. Blatter, and G. Kappenberger.
In: Symposium on Remote Sensing in Glaciology; Proceedings of the third symposium on glaciology, Cambridge (England), September 16-20, 1974. Journal of Glaciology, Vol. 15, No. 73, p 241-250, 1975. 12 fig, 3 tab, 6 ref.

Descriptors: *Sea ice, *Water, *Temperature, *Remote sensing, Infrared radiation, Measurement, Equipment, On-site data collections, Aircraft, Data processing, Analytical techniques.
Identifiers: *Baffin Bay, Radiometers.

Ice and water surface temperatures were measured with an airborne radiation thermometer PRT-5 over the North Water polynya during three missions between late winter and early summer 1974. Error corrections, problems of data analyses, and mapping were discussed. Attempts were made to relate the main types of sea ice to temperature ranges, which then were used in conjunction with satellite pictures to produce surface temperature maps. (See also W76-05372) (Sims-ISWS)
W76-05389

THE ANALYSIS OF THE NEAR-SURFACE ENERGY TRANSFER ENVIRONMENT FROM THERMAL INFRARED IMAGERY,
Michigan Univ., Ann Arbor. Dept. of Geography.
S. I. Outcalt.
In: Symposium on Remote Sensing in Glaciology; Proceedings of the third symposium on glaciology, Cambridge (England), September 16-20, 1974. Journal of Glaciology, Vol. 15, No. 73, p 267-276, 1975. 5 fig, 2 tab, 21 ref.

Descriptors: *Energy transfer, *Remote sensing, *Infrared radiation, *Alaska, Ice, Glaciers, Sea ice, Snow, Radiation, Thermal radiation, Heat transfer, Aircraft, Equipment, Mapping, Glaciology.
Identifiers: *Thermal mapping, Radiometers.

The radiant surface temperature imaged by thermal infrared line-scanning equipment is a product of both surface temperature and emissivity. In detail it is the integrated product of evolutionary development of the near-surface energy transfer regime. The variation of surface radiant temprature spatially and temporally contains information about the structure, composition, and thermal state of near surface materials. It was suggested that the study of ground ice, sea/lake ice, and the thermal regimes of mountain snow and ice bodies, are reasonable targets for the quantitative application of thermal mapping technology, and that considerable technical development effort be expended on spectral, spatial, and temporal operators for use in computer processing of pictures for glaciological data. (See also W76-05372) (Sims-ISWS)
W76-05390

SIGNIFICANCE OF SURFACE TEMPERATURE IN THE THERMAL INFRARED SENSING OF SEA AND LAKE ICE,
Army Engineer Topographic Labs., Fort Belvoir, Va. Center for Remote Sensing.
A. O. Poulin.
In: Symposium on Remote Sensing in Glaciology; Proceedings of the third symposium on glaciology, Cambridge (England), September 16-20, 1974. Journal of Glaciology, Vol. 15, No. 73, p 277-283, 1975. 3 fig, 9 ref.

Descriptors: *Sea ice, *Remote sensing, *Temperature, Radiation, Infrared radiation, Snow, Thermal radiation, Thermal conductivity, *Lake ice, Snow cover, Heat flow.
Identifiers: *Thermal mapping, Radiometers, Surface temperature, Ice thickness, Snow depth.

Thermal infrared sensing can provide much information about sea ice, and some of the physical conditions associated with sea ice suggest that surface temperature may be a good indicator of ice thickness. However, steady-state heat-flow calculations suggest that the variable thickness of the snow cover and its low, variable thermal conductivity would preclude the use of surface temperature alone as a suitable indicator of ice thickness. Measurement of surface temperature, snow depth, and ice thickness suggest that, in an area of relatively uniform ice thickness, surface temperature might be useful as an indicator of snow depth if some surface data can be obtained. (See also W76-05372) (Sims-ISWS)
W76-05391

SEASONAL EFFECTS ON GROUND-WAVE PROPAGATION IN COLD REGIONS,
Research Inst. of National Defence, Stockholm (Sweden).
A. Blomquist.
In: Symposium on Remote Sensing in Glaciology; Proceedings of the third symposium on glaciology, Cambridge (England), September 16-20, 1974. Journal of Glaciology, Vol. 15, No. 73, p 285-303, 1975. 12 fig, 27 ref.

Descriptors: *Radio waves, *Cold regions, *Model studies, Mathematical models, On-site investigations, Conductivity, Soils, Frozen soils, Electric fields, Electrical properties, Radiation, Glaciology, Seasonal, Electrical engineering, *Seasonal.
Identifiers: *Ground-wave propagation, Dielectric constant.

The ground-wave is the most important mode of propagation of radio waves in connection with glaciology. In cold regions, special conditions are often prevalent, involving propagation over non-homogeneous earth, presence of stratified media, and low values of conductivity and dielectric constant in the upper strata. A radio wave which propagates along the Earth's surface is, however, also influenced by atmospheric refraction. As the frequency is increased, the roughness of the Earth's surface must also be taken into account. Thus seasonal variations are to be expected due to changes in the electrical and topographical properties of the ground as well as the propagation conditions in the atmosphere. It is, however, difficult to separate these various effects, a fact which reduces the possibility of using ground-wave propagation as a tool for obtaining information on the properties of the ground. In many practical cases of ground-wave propagation in arctic regions, the formula for the ground-wave field strength can be written in a very simple way. Such a propagation model for frequencies above 30 MHz was presented in which account is taken of the Earth's curvature, the terrain irregularities, and the effect of the tropospheric refraction. This model also included the recovery effect which occurs in propagation over mixed paths. (See also W76-05372) (Sims-ISWS)
W76-05392

CHARACTERIZATION OF COLD-REGIONS TERRAIN USING AIRBORNE LASER PROFILOMETRY,
Cold Regions Research and Engineering Lab., Hanover, N. H.
W. D. Hibler, III.
In: Symposium on Remote Sensing in Glaciology; Proceedings of the third symposium on glaciology, Cambridge (England), September 16-20, 1974. Journal of Glaciology, Vol. 15, No. 73, p 329-347, 1975. 13 fig, 25 ref.

Descriptors: *Terrain analysis, *Sea ice, *Remote sensing, *Arctic, Cold regions, Ice, Aircraft, Equipment, Instrumentation, Data processing, Analytical techniques, Tundra.
Identifiers: *Laser profilers, *Sea-ice ridging.

A review was provided of the characteristics of airborne laser profilometry and its application to quantitative characterization of cold-regions terrain. The limitations of profilometry due to the profiler instrumental characteristics and instability of the aircraft platform were discussed. For typical aircraft speeds of the order of 100 m/s these limitations restrict the accurately measured roughness content to the approximate wavelength range 2 m to 300 m. Digital filtering and hardware techniques for removing the aircraft motion were discussed. Regarding terrain characterization, particular attention was given to Arctic sea ice. Ridge height and spacing distribution models for sea ice in conjunction with digitally processed laser profiles allow efficient characterization of sea-ice ridging using only a few parameters. In particular, a single ridging intensity parameter has been found to allow reasonable estimation of the number of ridges encountered at any height level along a straight-line path. Examination of spectral characteristics of first-year and multi-year ice suggested that laser profiles may be used to identify the ice type of floes and ridges. Comparisons of laser data and submarine sonar data were made which suggested that ratios of about 6.5 : 1 can be used to estimate ridge keel depths from laser data. (See also W76-05372) (Sims-ISWS)
W76-05393

A SUBMARINE SONAR STUDY OF ARCTIC PACK ICE,
Scott Polar Research Inst., Cambridge (England).
E. Williams, C. Swithinbank, and G. de Q. Robin.
In: Symposium on Remote Sensing in Glaciology; Proceedings of the third symposium on glaciology, Cambridge (England), September 16-20, 1974. Journal of Glaciology, Vol. 15, No. 73, p 349-362, 1975. 12 fig, 5 tab, 5 ref.

Descriptors: *Sea ice, *Arctic Ocean, *Sonar, *Submarines, *Arctic, Ice, Measurement, Remote sensing, Acoustics, Sound waves, Oceans, Oceanography.
Identifiers: *Sea-ice thickness, Sea-ice draft, Sea-ice ridging.

A continuous profile of the Arctic Ocean ice canopy from Spitsbergen to the North Pole was made with 48 kHz echo sounders mounted on a nuclear submarine. A semi-automatic digitizer was used to measure coordinates from the records at a frequency of about 1,000 points per linear kilometer of track. Methods derived for the reconstruction of subglacial relief from 35 MHz radio-echo

sounding records were applied to eliminate part of the distortion due to the 20 deg beam width of the sounders. A corrected profile was used to obtain ice drafts at 2 m intervals. Data were analyzed in 10 km sections and figures were summarized for each degree of latitude. The results included: mean ice draft, percentage of ice less than 0.3 m draft, and percentage of level ice. Histograms showed the level ice drafts which occur most frequently, and these may indicate the ratio of first-year to older ice. The number of ice keels was listed together with their mean draft and draft distribution. Definitions were found to be of overriding importance in the comparison of data from different areas. (See also W76-05372) (Sims-ISWS)
W76-05394

SATELLITES--NEW GLOBAL OBSERVING TECHNIQUES FOR ICE AND SNOW,
National Aeronautics and Space Administration, Greenbelt, Md. Goddard Space Flight Center.
P. Gloersen, and V. V. Salomonson.
In: Symposium on Remote Sensing in Glaciology; Proceedings of the third symposium on glaciology, Cambridge (England), September 16-20, 1974. Journal of Glaciology, Vol. 15, No. 73, p 373-389, 1975. 21 fig, 13 ref.

Descriptors: *Satellites(Articial), *Ice, *Snow, *Remote sensing, Glaciers, Snow cover, Sea ice, Ice cover, Snowmelt, Melt water, Runoff, Watersheds(Basins), Water resources, Hydrology.
Identifiers: *ERTS, Nimbus satellites.

The capabilities of satellite observations for assessing snow and ice resources on Earth have been greatly improved through the utilization of higher resolution imaging systems and multispectral images in the wavelength range from 0.4 micrometer to 1.55cm. The possibility that the variation in areal extent of the snow cover may be related by empirical means to the average monthly run-off in a given watershed was demonstrated by comparing run-off records from the Indus River Basin in southeast Asia with a series of snow-cover maps obtained from Nimbus-3 and 4 imagery. Similar studies using the higher spatial resolution available with ERTS-I imagery were carried out for the Wind River Mountains watersheds in Wyoming, where it was found that the empirical relationship varied with mean elevation of the watershed. In addition, digital image-enhancement techniques were shown to be useful for identifying glacier features thought to be related to extent of snow cover, moraine characteristics, debris coverage, and the like. Finally, longer wavelength observations using sensors on board the Nimbus-5 satellite were shown to be useful for indicating crystal size distributions and onset of melting on glacier snow cover. (See also W76-05372) (Sims - ISWS)
W76-05396

ERTS DATA IN GLACIOLOGY--AN EFFORT TO MONITOR GLACIER MASS BALANCE FROM SATELLITE IMAGERY,
Norges Vassdrags- og Elektrisitetsvesen, Oslo.
G. Ostrem.
In: Symposium on Remote Sensing in Glaciology; Proceedings of the third symposium on glaciology, Cambridge (England), September 16-20, 1974. Journal of Glaciology, Vol. 15, No. 73, p 403-415, 1975. 10 fig, 6 ref.

Descriptors: *Remote sensing, *Glaciers, *Hydroelectric plants, *Satellites(Artifical), Aerial photography, Snow cover, Ice, Runoff, Snowmelt, Snow surveys, Snowpacks, Data processing.
Identifiers: *ERTS data, *Norway, *Glacier mass balance.

Due to increased demand for electric energy, which in Norway is produced almost entirely by hydro-electric power plants, extensive glacierized basins are now considered for future power production. However, glacier behavior has a great impact on the annual run-off from these basins, and information about expected annual deviations from a 'normal' discharge must be obtained from mass-balance studies on representative glaciers within the basin. For this reason such studies are presently performed at eight selected Norwegian glaciers. The transient snow line can be identified easily on conventional air photographs and its height determined by direct comparisons with reliable topographic maps (with contour lines on glaciers). The resolution in ERTS images is sufficiently good to use the satellite data for a similar height determination of the transient snow line on glaciers--at least on the larger valley glaciers and, of course, on ice caps. Due to an existing correlation between the height of the transient snow line (at the end of the melt season) and the annual specific net mass balance, it is possible to construct a diagram expressing this relationship, provided detailed mass-balance studies have been performed during a period of several years of different mass-balance conditions. (See also W76-05372) (Sims - ISWS)
W76-05397

ANTARCTIC SEA-ICE VARIATIONS FROM SATELLITE SENSING IN RELATION TO CLIMATE,
Department of Science, Melbourne (Australia). Antarctic Div.
W. F. Budd.
In: Symposium on Remote Sensing in Glaciology; Proceedings of the third symposium on glaciology, Cambridge (England), September 16-20, 1974. Journal of Glaciology, Vol. 15, No. 73, p 417-427, 1975. 7 fig, 22 ref, 1 append.

Descriptors: *Antarctic, *Sea ice, *Remote sensing, *Satellites(Artificial), Temperature, Ice cover, Polar regions, Climates, Climatology.

An analysis of records of annual mean temperatures around Antarctica shows large-scale anomalies of thousands of kilometers extent with typical variations of 2 deg from one year to another. From 1967 on, composite satellite photographs are available which show considerable variation in the sea-ice extent in different years up to about 5 deg of latitude. These largest differences seem to persist over entire seasons. In general there seems to be considerable association between the region around the Antarctic with the coldest temperatures and the regions of greatest sea-ice extent. An analysis of long-term records at a single location near the edge of the Antarctic sea ice indicated a strong correlation between variations in the annual mean temperature and the duration of the sea ice, such that a change 1 deg in the annual mean temperature corresponds to about 70 d variation in the duration of the sea ice. A relation was obtained between variations of annual mean temperature and the mean extent of the sea ice, namely, a 1 deg change corresponds to approximately 2.5 deg latitude variation in the maximum sea-ice extent. The magnitude of the variations in the sea-ice extent observed from the satellite data in comparison with the large-scale temperature anomalies was compatible with the above relations, although some rotational shifts appear to take place. (See also W76-05372) (Sims - ISWS)
W76-05398

THE USE OF ERTS PHOTOGRAPHS TO MEASURE THE MOVEMENT AND DEFORMATION OF SEA ICE,
Bristol Univ. (England). H. H. Wills Physics Lab.
J. F. Nye.
In: Symposium on Remote Sensing in Glaciology; Proceedings of the third symposium on glaciology, Cambridge (England), September 16-20, 1974. Journal of Glaciology, Vol. 15, No. 73, p 429-436, 1975. 3 fig, 7 ref.

Descriptors: *Sea ice, *Antarctic, *Remote sensing, *Movement, *Deformation, Strain Satellites(Artificial), Ice, Ice cover, Polar regions, Photography, Model studies, Mathematical models.
Identifiers: *ERTS.

Is it justified to adopt a two-dimensional continuum model for the movement and large-scale deformation of pack ice. A preliminary study of ERTS-I photography showed that the details of the ice movement are readily measurable; the problem is not in the accuracy of the remote sensing but in the inherent graininess of the sea ice. There is a spatial variation of ice velocity on a scale of several hundreds of kilometers; smaller-scale variations are superimposed on this, but their amplitude is not enough to obscure the large-scale trend. A continuum model is applicable, but, because of the small-scale variations in the velocity of the sea ice itself, it is not meaningful to specify continuum strain-rates on a scale of, say, 100 km to more than a certain accuracy. If ERTS pictures are available during the AIDJEX main experiment, they could provide the necessary strain and displacement measurements for comparison with the predictions of the AIDJEX model. (See also W76-05372) (Sims - ISWS)
W76-05399

GENERAL DISCUSSION, THE STATE OF THE ART--AND WHERE DO WE GO FROM HERE.
For primary bibliographic entry see Field 2C.
W76-05400

EXPERIMENTAL DETERMINATION OF SOIL MOISTURE ON IRRIGATED LANDS FROM RADIOACTIVE SOIL EMISSION,
For primary bibliographic entry see Field 2G.
W76-05401

A NOTE ON THE USE OF THE PHILIP INFILTRATION EQUATION,
Commonwealth Scientific and Industrial Research Organization, Canberra (Australia). Div. of Environmental Mechanics.
For primary bibliographic entry see Field 2G.
W76-05411

REMOTE SENSING,
Geological Survey, Reston, Va.
A. N. Kover.
Geotimes, Vol 21, No 1, p 35-36, January 1976.

Descriptors: *Data collections, *Hydrology, *Remote sensing, *Satellites(Artificial), *Networks, Snowpacks, Runoff, Forecasting, Glaciers, Movement, *Mapping, Geology, Mineralogy.
Identifiers: *LANDSAT data.

Landsat data have proved adequate for mapping snowpack in forecasting runoff. However, the data are required within 2 to 3 days to make productive rather than retrospective forecasts. Landsat imagery has been effective in monitoring the movement of glaciers and in mapping surging glaciers in Iceland, Alaska, and other areas. The extent of flooding has been mapped in many regions. Data Collection Platforms (DCP) have demonstrated the cost-effectiveness of automatic collection and relay of hydrologic and environmental data. The U.S. Geological Survey's Nationwide Computer System, tied into the Data Collection System of Landsat, gives 150 remote terminals almost real-time access to processed data from 75 DCPs. Additional capacity for DCP relay is afforded by the NOAA series of Geostationary Operational Environmental Satellites. (Woodard-USGS)
W76-05431

7C. Evaluation, Processing and Publication

ECONOMIC IMPACT OF FISCAL CONSTRAINTS ON WATER PROJECT CONSTRUCTION, USER'S GUIDE.
Harza Engineering Co., Chicago, Ill.
For primary bibliographic entry see Field 6B.
W76-05001

ECONOMIC IMPACT OF FISCAL CONSTRAINTS ON WATER PROJECT CONSTRUCTION, (CARD DECK).
Harza Engineering Co., Chicago, Ill.
For primary bibliographic entry see Field 6B.
W76-05002

NUMERICAL SIMULATION OF SALT-WATER INTRUSION IN COASTAL AQUIFERS, PART 1,
Princeton Univ., N. J. Dept. of Geological and Geophysical Sciences.
For primary bibliographic entry see Field 5B.
W76-05010

NUMERICAL SIMULATION OF SALT-WATER INTRUSION IN COASTAL AQUIFERS, PART 2,
Princeton Univ., N. J. Dept of Geophysical Sciences.
For primary bibliographic entry see Field 5B.
W76-05011

STOCHASTIC PROJECTIONS FOR WATER RESOURCES PLANNING,
Texas Univ. at Austin. Center for Research in Water Resources.
For primary bibliographic entry see Field 6A.
W76-05012

THE DETECTION AND MAPPING OF SUBTERRANEAN WATER BEARING CHANNELS--PHASE II,
Missouri Univ., Rolla. Dept. of Geophysics.
For primary bibliographic entry see Field 4B.
W76-05129

PUBLIC GROUNDWATER SUPPLIES IN CHAMPAIGN COUNTY,
Illinois State Water Survey, Urbana.
For primary bibliographic entry see Field 4B.
W76-05130

PUBLIC GROUNDWATER SUPPLIES IN CALHOUN COUNTY,
Illinois State Water Survey, Urbana.
For primary bibliographic entry see Field 4B.
W76-05131

PUBLIC GROUNDWATER SUPPLIES IN MASSAC COUNTY,
Illinois State Water Survey, Urbana.
For primary bibliographic entry see Field 4B.
W76-05132

A PROPOSED INDEX FOR COMPARING HYDROGRAPHS,
Maryland Univ., College Park. Dept. of Civil Engineering.
For primary bibliographic entry see Field 2A.
W76-05157

CAPABILITY OF INTEGER PROGRAMMING ALGORITHMS IN SOLVING WATER RESOURCE PLANNING PROBLEMS,
Utah Center for Water Resources Research, Logan.
For primary bibliographic entry see Field 6A.
W76-05183

FLOOD PLAIN INFORMATION: FARMINGTON AND CONNECTICUT RIVERS, WINDSOR, CONNECTICUT.
Army Engineer District, Waltham, Mass.
For primary bibliographic entry see Field 4A.
W76-05256

FLOOD PLAIN INFORMATION: WEST BRANCH DUPAGE RIVER, KRESS CREEK, AND KLEIN CREEK, DUPAGE COUNTY, ILLINOIS.
Army Engineer District, Chicago, Ill.
For primary bibliographic entry see Field 4A.
W76-05257

SPECIAL FLOOD HAZARD INFORMATION: DUNN BRANCH, WOODBINE, GEORGIA.
Army Engineer District, Savannah, Ga.
For primary bibliographic entry see Field 4A.
W76-05258

SPECIAL FLOOD HAZARD INFORMATION: ARKANSAS RIVER AND WILD HORSE CREEK, HOLLY, COLORADO.
Army Engineer District, Albuquerque, N. Mex.
For primary bibliographic entry see Field 4A.
W76-05262

1973 WESTERN STATE CONFERENCE ON WATER INFORMATION DISSEMINATION.
Arizona Water Resources Research Center, Tucson.
For primary bibliographic entry see Field 10D.
W76-05270

SALINE WATER CONVERSION ENGINEERING DATA BOOK - 1975.
Kellogg (M. W.) Co., Piscataway, N. J.
For primary bibliographic entry see Field 3A.
W76-05347

SYMPOSIUM ON REMOTE SENSING IN GLACIOLOGY.
International Glaciological Society, Cambridge (England).
For primary bibliographic entry see Field 2C.
W76-05372

VELOCITY OF RADIO WAVES IN ICE BY MEANS OF A BORE-HOLE INTERFEROMETRIC TECHNIQUE,
Scott Polar Research Inst., Cambridge (England).
For primary bibliographic entry see Field 7B.
W76-05383

SEA-ICE RECONNAISSANCE BY RADAR,
Hokkaido Univ., Sapporo (Japan). Inst. of Low Temperature Science.
For primary bibliographic entry see Field 7B.
W76-05387

CHARACTERIZATION OF COLD-REGIONS TERRAIN USING AIRBORNE LASER PROFILOMETRY,
Cold Regions Research and Engineering Lab., Hanover, N. H.
For primary bibliographic entry see Field 7B.
W76-05393

A SUBMARINE SONAR STUDY OF ARCTIC PACK ICE,
Scott Polar Research Inst., Cambridge (England).
For primary bibliographic entry see Field 7B.
W76-05394

ERTS DATA IN GLACIOLOGY--AN EFFORT TO MONITOR GLACIER MASS BALANCE FROM SATELLITE IMAGERY,
Norges Vassdrags- og Elektrisitetsvesen, Oslo.
For primary bibliographic entry see Field 7B.
W76-05397

GENERAL DISCUSSION, THE STATE OF THE ART--AND WHERE DO WE GO FROM HERE.
For primary bibliographic entry see Field 2C.
W76-05400

FLOOD PROFILES AND INUNDATED AREAS ALONG THE DESCHUTES RIVER, WASHINGTON,
Geological Survey, Tacoma, Wash.
For primary bibliographic entry see Field 2E.
W76-05415

WATER-LEVEL RECORDS FOR THE NORTHERN HIGH PLAINS OF COLORADO, 1972-76,
Geological Survey, Denver, Colo.
T. J. Major, and K. D. Vaught.
Open-file report, February 1976. 29 p, 2 fig, 1 tab.

Descriptors: *Hydrologic data, *Groundwater resources, *Well data, *Water levels, *Colorado, Aquifers, Water utilization, Irrigation, Basic data collections, Great Plains.
Identifiers: *Northern high plains(Colo).

Water-level measurements were made in more than 600 northern Colorado wells in January 1976. Changes in water levels from January 1975 to January 1976 ranged from a rise of about 5 feet (1.5 metres) in Washington County to a decline of about 20 feet (6.1 metres) near the Kiowa-Prowers County line. Measurements for the four preceding winters are also included to serve as references illustrating declining or rising water levels. These data can be used by well owners for planning their schedules for the next irrigation season and can be used by water managers for developing plans to manage the groundwater resources. (Woodard-USGS)
W76-05420

ANNUAL MAXIMUM STAGES AND DISCHARGES OF NORTH CAROLINA STREAMS,
Geological Survey, Raleigh, N. C.
N. O. Thomas, and W. G. Bonham.
North Carolina Department of Natural and Economic Resources, Raleigh, Report, 1975. 223 p 4 fig, 1 tab, 22 ref.

Descriptors: *Annual peak discharge, *North Carolina, *Streams, *Stream gages, Hydrologic data, Floods, Streamflow, Flood control, Basic data collections.
Identifiers: *Annual maximum stage, Flooding potential.

Annual maximum stages and discharges are presented for continuous-record and crest-stage gaging stations in North Carolina. Data are included for 391 active and discontinued stations operated by the U. S. Geological Survey and other Federal agencies, primarily the National Weather Service, for which there were five or more years of record as of September 30, 1973. The location and pertinent information on the operation of each gaging station are also given. Basic data on flood stages and discharges are needed for zoning flood plains, for flood-proofing of structures, and for assessing flood damages and the value of channel improvements. (Woodard-USGS)
W76-05423

GROUND-WATER DATA NEAR THE NORTHWEST SHORE OF TOPAZ LAKE, DOUGLAS COUNTY, NEVADA,
Geological Survey, Carson City, Nev.

J. R. Harrill, and J. O. Nowlin.
Open-file report 76-90, 1976. 12 p 2 fig, 2 tab, 4 ref.

Descriptors: *Basic data collections, *Groundwater, *Well data, *Aquifer characteristics, *Water levels, *Nevada, Land development, Septic tanks, Environmental effects, Hydrologic systems, Recreation facilities.
Identifiers: *Topaz Lake area(Nev).

This report contains a tatulation of data for 34 wells and 2 springs, photo-base maps showing contours of the altitude of and depth to water in wells, and a tabulation of 17 drillers'logs in an area adjacent to the northwest shore of Topaz Lake, a small reservoir about 20 miles south of Gardnerville in Douglas County, Nev. The study area encompasses approximately 1 square mile extending about 1.5 miles north along U. S. Highway 395 from the Nevada-California State line. The area is on a moderately to steeply sloping surface composed primarily of alluvial fan deposits. Boulder and clay deposits typical of those formed by mudflows predominate in the south half of the area. Some sand and gravel deposits also underlie the margins of the lake and the east-central partof the area. There are about 60 residences, 3 restaurant-lodge facilities, and a campground-marina in the area. All are served by septic-tank systems. If fully developed according to current plans, the area would contain slightly more than 200 residences. The purpose of this study is to provide data on groundwater conditions that are prerequisite to any analysis of effects of septic-tank effluent on the hydrologic system. (Woodard-USGS)
W76-05424

GEOHYDROLOGIC RECONNAISSANCE AND MEASUREMENT OF PERENNIAL STREAMS CROSSING OUTCROPS OF THE MADISON LIMESTONE, NORTHEASTERN WYOMING, 1974,
Geological Survey, Cheyenne, Wyo.
For primary bibliographic entry see Field 2E.
W76-05425

TIME-OF-TRAVEL OF SOLUTES IN THE TRINITY RIVER BASIN, TEXAS, SEPTEMBER 1973 AND JULY-AUGUST 1974,
Geological Survey, Fort Worth, Tex.
R. H. Ollman.
Open-file report 75-558, November 1975. 3 sheets, 2 fig, 2 tab.

Descriptors: *Travel time, *Rhodamine, *Dyes, Streamflow, *Path of pollutants, *Texas, Low flow, Average flow, Data collections, Gaging stations, Sampling, Analytical techniques, Fluorometry, Hydrographs, *Maps, Forecasting, Water quality, Mathematical models.
Identifiers: *Trinity River basin(Tex).

The U. S. Geological Survey, in cooperation with the U. S. Army Corps of Engineers and the Trinity River Authority of Texas, conducted time-of-travel studies in the Trinity River basin during a period of low flow September 19-23, 1973, and during a period of moderate flow July 23-August 1, 1974. The purpose of these studies was to provide data that could be used by the Trinity River Authority as part of the basic input to a mathematical water-quality model of the river. The model is being developed as part of a comprehensive water-quality management plan for the basin. The time-of-travel of solutes in the Trinity River and West Fork Trinity River was determined by injecting a fluorescent dye (Rhodamine WT, 20-percent solution) that could be detected by fluorometric analysis of water samples collected at selected downstream sites. Plots of observed dye concentration versus time were made for each injection and sampling site, and a smooth curve was drawn. The resulting curves were then used to determine arrival times of the leading edge, the peak, and the trailing edge of the dye cloud. The trailing edge was defined as the concentration value equal to 10 percent of the peak concentration. Measurements of the concentration and dispersion of the dye provide information on the probable behavior of soluble contaminants that might be introduced in the reaches studied. (Woodard-USGS)
W76-05426

WATER RESOURCES OF BASINS FOR MINOR STREAMS DRAINING INTO ST. CLAIR RIVER, LAKE ST. CLAIR, DETROIT RIVER, AND LAKE ERIE, SOUTHEASTERN MICHIGAN,
Geological Survey, Lansing, Mich.
F. R. Twenter, R. L. Knutilla, and T. R. Cummings.
For sale by USGS Reston, Va 22092, for $2.50 per set. Hydrologic Investigations Atlas HA-546, 1975. 3 sheets.

Descriptors: Water resources, *Surface waters, *Groundwater, *Water quality, *Michigan, Hydrologic data, *Maps, Hydrology, Precipitation(Atmospheric), Streamflow, Runoff, Aquifers, Water quality, Water utilization, Water supply, Hydrogeology, Topography, Lakes, Lake Erie.
Identifiers: *St. Clair River basin(Mich), *Detroit River basin(Mich), Minor streams(Southeastern Mich).

This hydrologic atlas represents a part of a comprehensive study of the water resources of southeastern Michigan. Its purpose is to provide information on (1) the physical features of basins for minor streams draining into St. Clair River, Lake St. Clair, Detroit River, and Lake Erie, (2) the characteristics of streamflow, (3) the quality of surface water and groundwater, and (4) the availability of groundwater. The atlas is one in a series on the river basins in southeastern Michigan. The minor streams in southeastern Michigan drain an area of 985 sq mi, which includes parts of St. Clair, Macomb, Wayne, Washtenaw, Lenawee, and Monroe Counties. Almost all the land surface drained by the streams was formerly covered by glacial lakes. The minor streams have natural drainage networks that are not well developed. Most streams have eroded less than 10 ft below the adjacent land surface. In short reaches, generally near their mouths, the streams are incised more than 10 ft. In all areas drained by the minor streams, natural drainage has been augmented by ditches and drains. There are about 450 lakes and ponds within the study area. Most lakes and ponds are relatively small; 52 percent are less than 1 acre; only 11 percent exceed 10 acres. (Woodard-USGS)
W76-05427

WATER RESOURCES OF THE MISSISSIPPI AND SAUK RIVERS WATERSHED, CENTRAL MINNESOTA,
Geological Survey, St. Paul, Minn.
J. O. Helgesen, D. W. Ericson, and G. F. Lindholm.
For sale by USGS Reston, Va 22092, for $2.25 per set. Hydrologic Investigations Atlas HA-534, 1975. 3 sheets, 19 ref.

Descriptors: *Water resources, *Watersheds(Basins), *Mississippi River, *Minnesota, Hydrology, Precipitation(Atmospheric), *Maps, Surface waters, Streamflow, Runoff, Groundwater resources, Aquifers, Water quality, Water utilization, Water supply, Hydrogeology.
Identifiers: *Sauk River basin(Minn).

A variety of glacial landforms (moraines, till plains, drumlim fields and outwash plains) characterize the 3,890-square mile Mississippi and Sauk Rivers watershed in central Minnesota. Maps and illustrations show, in addition to other data, that: (1) Average annual inflow to the watershed, as precipitation, was 26.6 in. during 1939-68. Average annual outflow during the same period was 4.4 in. as runoff and 22.2 in. as evapotranspiration. (2) All municipalities except St. Cloud use groundwater as a source of supply. St. Cloud, the largest city, obtains its water from the Mississippi River. Nearly all the 1,890 million gallons of groundwater withdrawn by municipalities in 1968 was from glacial-drift aquifers. (3) Water usage for irrigation, primarily on sandy soils derived from surficial outwash, totaled 1,090 million gallons in 1968. (4) Flow characteristics of the Mississippi River are affected by regulation of six reservoirs upstream from the watershed. (5) The quality of Mississippi River water does not change significantly as it moves through the watershed. Dissolved-solids content, iron content, and color vary significantly with discharge. (6) Groundwater and surface water are of the calcium magnesium bicarbonate type and chemically suitable for most purposes. Iron and manganese concentrations and hardness in groundwater are troublesome in some areas. (Woodard-USGS)
W76-05428

WATER RESOURCES OF THE HURON RIVER BASIN, SOUTHEASTERN MICHIGAN,
Geological Survey, Grayling, Mich.
R. W. Larson, W. B. Allen, and S. D. Hanson.
For sale by USGS Reston, Va 22092, for $1.75 per set. Hydrologic Investigations Atlas HA-514, 1975. 2 sheets.

Descriptors: Water resources, *Surface waters, *Groundwater, *Water quality, *Michigan, Hydrologic data, *Maps, Hydrology, Watersheds(Basins), Streamflow, Runoff, Lakes, Aquifers, Water yield, Water utilization, Water demand, Water supply, Urbanization.
Identifiers: *Huron River basin(Mich).

This hydrologic atlas represents a part of a comprehensive study of the water resources of southeastern Michigan. Its purpose is to provide information on (1) physical features of the Huron River and its tributaries, (2) characteristics of streamflow, (3) quality of ground and surface water, and (4) availability of groundwater. The atlas is one in a series on river basins in southeastern Michigan. The Huron River basin, in the zone of influence of the Detroit metropolitan area, has been subjected to urbanization. Population between 1960 and 1970 in Washtenaw County increased by 35.8 percent. The city of Ann Arbor grew in population by 48.2 percent, Ypsilanti by 40.9 percent, and Livingston County by 54.2 percent. The basin drains a hatchetshaped area of 908 sq mi. Continental glaciers covered the entire basin and left deposits of sand, sandy till, and gravelly loam. About 80 percent of the basin is underlain by these deposits. The basin has more than 300 named natural and artificial lakes ranging in size from less than an acre to the 1,270 acre Belleville Lake. In addition, there are more than 750 unnamed lakes and ponds. Most lakes are in depressions left by glaciers in the morainal areas north and west of Ann Arbor. (Woodard-USGS)
W76-05429

HYDROLOGIC UNIT MAP--1974, CARIBBEAN REGION.
Geological Survey, Reston, Va.
For sale by USGS, Reston, Va. 22092, for $1.00. Hydrologic Unit Map, 1975. 1 sheet.

Descriptors: *Maps, *Hydrology, *Puerto Rico, Water resources, Islands, Data collections, Planning, Hydrologic systems, Regions, Land resources.
Identifiers: *Caribbean Region(PR), Isla De Vieques(PR), Isla De Culebra(PR), Isla Mona(PR), *Hydrologic unit maps, Hydrologic boundaries, Subregions, Accounting units, Catologing units.

This map and accompanying table show Hydrologic Units in the Caribbean Region that are basically hydrographic in nature. The islands included are Puerto Rico, Isla De Vieques, Isla De Culebra, and Isla Mona. The Cataloging Units shown will sup-

plant the Cataloging Units previously used by the U. S. Geological Survey in its Catalog of Information on Water Data (1966-72). The Regions, Subregions and Accounting Units are aggregates of the Cataloging Units. The Regions and Subregions are currently (1974) used by the U. S. Water Resources Council for comprehensive planning, inclding the National Assessment, and as a standard geographical framework for more detailed water and related land-resources planning. The Accounting Units are those currently (1974) in use by the U. S. Geological Survey for managing the National Water Data Network. (Woodard-USGS)
W76-05430

REMOTE SENSING,
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 7B.
W76-05431

DESIGN OF GROUND WATER LEVEL OBSERVATION-WELL PROGRAMS,
Geological Survey, Raleigh, N. C. Water Resources Div.
For primary bibliographic entry see Field 4B.
W76-05451

8. ENGINEERING WORKS

8A. Structures

ECONOMIC IMPACT OF FISCAL CONSTRAINTS ON WATER PROJECT CONSTRUCTION, USER'S GUIDE.
Harza Engineering Co., Chicago, Ill.
For primary bibliographic entry see Field 6B.
W76-05001

ECONOMIC IMPACT OF FISCAL CONSTRAINTS ON WATER PROJECT CONSTRUCTION, (CARD DECK).
Harza Engineering Co., Chicago, Ill.
For primary bibliographic entry see Field 6B.
W76-05002

PERSPECTIVES ON THE ARMY ENGINEERS WATER MANAGEMENT MISSION,
Corps of Engineers, Washington, D.C.
For primary bibliographic entry see Field 6E.
W76-05211

8B. Hydraulics

FEASIBILITY OF HYDRAULIC TRANSPORT OF GROUND HOUSEHOLD REFUSE THROUGH SEWER APPURTENANCES,
Foster-Miller Associates, Inc., Waltham, Mass.
For primary bibliographic entry see Field 5D.
W76-05070

THE APPLICATION OF A SPILLWAY FOR RIVER FLOOD CONTROL,
Thames Water Authority. London (England).
For primary bibliographic entry see Field 4A.
W76-05098

LONGITUDINAL DISPERSION IN NATURAL CHANNELS,
Geological Survey of Canada, Ottawa (Ontario).
For primary bibliographic entry see Field 5B.
W76-05160

FLUME STUDY OF KNICKPOINT DEVELOPMENT IN STRATIFIED SEDIMENT,
Sydney Univ. (Australia). Dept. of Geography.
For primary bibliographic entry see Field 2J.
W76-05162

HEAT DISSIPATION FROM TURBULENT OPEN CHANNEL FLOW,
Georgia Inst. of Tech., Atlanta. School of Civil Engineering.
For primary bibliographic entry see Field 5B.
W76-05248

HYDRAULIC DESIGN CRITERIA FOR INLAND WATERWAYS,
Kansas Univ., Lawrence. Dept. of Civil Engineering.
J. S. McNown.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-250 771, $4.00 in paper copy, $2.25 in microfiche. Kansas Water Resources Research Institute, Manhattan, KWRRI Contribution No. 168, October 1975. 23 p, 7 fig, 1 tab, 10 ref. OWRT A-071-KAN(1), 14-31-0001-5016.

Descriptors: *Channel flow, *Design criteria, *Inland waterways, *Hydraulic design, *Canals, Channels, Navigation.
Identifiers: *Sinkage, Squat, Inland navigation, Power requirement, Ship drag.

The sinkage of a ship in a canal, which is due to the lowering of the water surface around it during the motion, can be readily calculated for canals of various cross sections. It is a function of the canal cross-section, the depth of water in the canal, the submerged cross-section of the ship or barge tow and the speed of the ship. The relationship can be expressed in both algebraic and graphical forms. The maximum sinkage is about one-fifth of the depth and occurs for a retangular channel with a barge that fills about one-fifth of the channel cross-section. More power is required to move a ship through a canal than in open water. The main reason is the constriction of the return flow in which the ship moves a large quantity of water from foreward of the ship, through the depressed area around it and astern where it returns to the normal level. Thus it raises a sizable amount of water a small vertical distance which is equal to the sinkage. Comparisons of calculations of the increase in power required based on this concept of the motion agree remarkably well with observed values obtained in a series of model studies at the University of Michigan.
W76-05254

RESISTANCE TO FLOW IN A COMBINED CHANNEL,
Oklahoma State Univ., Stillwater. Dept. of Agricultural Engineering.
C. E. Rice, and R. Araveeporn.
Transactions of the American Society of Agricultural Engineers, Vol. 18, No. 5, p 869-872, September-October, 1975. 6 fig, 3 ref. OWRT A-030-OKLA(3)

Descriptors: *Open channel flow, *Flood plains, *Roughness(Hydraulic), Hydraulics, Streams, Roughness coefficient, Channel flow, Hydraulic radius, Mannings equation, Flow, Laboratory tests, Flow resistance.
Identifiers: *Combined channel, *Hydraulic depth.

These experiments studied the flow characteristics in a combined channel with different hydraulic properties, main channel to floodplain widths and areas, slopes, and roughness. The results showed: (1) the hydraulic radius as ordinarily computed in a regular channel results in erroneous discharge values for a combined channel in the depth range immediately above bankfull stage of the main channel; (2) the floodplain flow appeared to have some retarding effect on the flow in a main channel; (3) the combined channel Manning coefficient increased as the floodplain width increased; (4) as the flood plain width decreased, the Manning coefficients for the floodplain and main channel approached the same value at floodplain to main channel depth ratios less than about 0.4; (5) the Manning coefficient for the combined channel reflects the effect of channel geometry as well as the effects of boundary roughness and slope; (6) the hydraulic radius of the floodplain was greater with a divider separating the two sections than without a divider for the same depth of flow in the main channel; (7) none of the methods commonly used to compute uniform flow discharge in a combined channel gave good results over the complete range of flow depths; and (8) except at very shallow floodplain depths, there was no difference in water surface elevation between the main channel and floodplain sections. (Lee-ISWS)
W76-05273

8C. Hydraulic Machinery

READILY ATTACHABLE WATER FILTER WITH CUTOFF VALVE,
Aqua-Chem, Inc., Milwaukee, Wis. (assignee)
R. M. McClory.
U.S. Patent No. 3,926,815, 4 p, 3 fig, 10 ref; Official Gazette of the United States Patent Office, Vol 941, No 3, p 1337, December 16, 1975.

Descriptors: *Patents, *Filters, *Water purification, *Water quality, *Water quality control, *Filtration, Domestic water, Water pollution control, *Valves, Equipment.
Identifiers: Filter cartridges, Replaceable equipment.

A water filter assembly permits filter cartridge removal and replacement in fast and simple manner without shutting off the main water supply and without cutting pipe. The filter unit includes a filter mounting block having internal conduit for directing water from a manifold on one face of the block through a filter housing containing a filter cartridge mounted on the opposite face of the block. Severed ends of the existing water pipe are brought into abutting relationship with the manifold and sealed to it by a suitable cover. The filter mounting block includes a valve for shutting off the internal conduits so that the filter housing may be removed to enable filter cartridge replacement. Sealing means are provided for adapting the unit to different pipe sizes. (Sinha - OEIS)
W76-05038

WATER POWER MACHINE AND UNDERSEA, UNDER WATER GENERATOR STATION,
R. E. Skorupinski.
U.S. Patent No, 3,927,330, 7 p, 5 fig, 8 ref Official Gazette of the United States Patent Office, Vol 941, No 3, p 1471, December 16, 1975.

Descriptors: *Patents, *Tidal streams, *Currents(Water), *Flow control, *Tidal energy, Todal effect, Tidal power plants, Underwater, Energy transfer, Energy conversion, Electric power.

An apparatus which intercepts a tidal flow or established stream in a larger body of water includes a framework supported on a foundation which is sunk on the bottom of a body of water. The framework includes a number of upright members which support a conveyor belt. The conveyor belt travels between two rollers and has a main or straight run along the length of the apparatus and a return run. The first run carries a number of buckets which are deployed to intercept the current flow. The buckets are constructed out of a number of pivotally mounted plates which have rollers on the end which engage guide rails which cause the plates to deploy at an extended position, thereby opening a chamber which is adapted to be filled with water. The chambers in the buckets dump water at the end of the first run and are pivotally constructed and arranged to collapse. The current flow is directed into the buckets by a set of louvers which are pivotally mounted to direct water flow toward the chambers in the bucket. The louvers pivotally rotate as a unit to

vary the angle of attack. The conveyor is connected to a link chain which is engaged with end rollers. The end rollers provide a power source which is taken off by a drive shaft connected to an electromechanical converter such as an alternator. The alternator provides electrical power. The control apparatus includes a mechanism for adjusting the louvers and a angle of the transverse plate. (Sinha - OEIS)
W76-05039

CROSS-CONNECTION CONTROL MANUAL.
Environmental Protection Agency, Washington, D. C. Office of Water Supply.
For primary bibliographic entry see Field 5F.
W76-05092

GUIDELINES FOR THE SELECTION OF TURBINE PUMP MATERIALS FOR USE IN GROUNDWATERS,
Queensland Univ., Brisbane (Australia). Dept. of Chemical Engineering.
For primary bibliographic entry see Field 8G.
W76-05406

SUPPRESSION OF DOMESTIC WATER HAMMER NOISE BY A SIMPLE WAVE DISPERSION TECHNIQUE,
New South Wales Univ., Kensington (Australia). Faculty of Military Studies.
For primary bibliographic entry see Field 8G.
W76-05408

8E. Rock Mechanics and Geology

FLUME STUDY OF KNICKPOINT DEVELOPMENT IN STRATIFIED SEDIMENT,
Sydney Univ. (Australia). Dept. of Geography.
For primary bibliographic entry see Field 2J.
W76-05162

8F. Concrete

PROTECTING REINFORCED CONCRETE PIPE SANITARY SEWERS,
K. Kienow.
Water and Sewage Works, Vol. 122, No. 10, p 94-97, October, 1975. 1 fig, 1 tab, 1 ref.

Descriptors: *Concrete pipes, *Sewers, *Alkalinity, *Pipes, Penetration, Rates, Design criteria, Engineering, Performance, Corrosion control.
Identifiers: *Sanitary sewers, Centrifugally spun concrete pipes.

A test program resulted in an equation from which the alkalinity of the inside of a concrete pipe could be determined. Design parameters on the life expectancy of centrifugally spun concrete pipe could be determined. Methods of increasing life expectancy have included adding extra concrete over reinforcing steel, using high alkaline aggregates, and using inert liners. An equation was published by the Environmental Protection Agency that relates the rate of penetration, or life expectancy, of a concrete pipe to the alkalinity of the inner wall. When concrete pipe is centrifugally spun high alkalinity results in the center. Tests have shown that such pipe has twice the corrosion resistance than conventionally made pipe. The alkalinity of the inside of the pipes was determined so that the designer could use the EPA information with regard to rate of penetration. Two methods are outlined. In one method, the time to penetrate the pipe wall is related to the alkalinity and the wall thickness. This product is known as the 'At' factor. In the most applied method, the time to expose the steel is related to the product of alkalinity and cover thickness over the reinforcing steel, 'Az'. This can be specified by the design engineer. The 'Az' number usually ranges from 0.20 to 2.25. The upper boundary corresponds to maximum sulfide values that usually occur in waste water. Various design examples are presented. (Pinto-FIRL)
W76-05099

8G. Materials

METHYLENE PHOSPHONATES OF GLYCIDYL REACTED POLYALKYLENE POLYAMINES AND USE IN SCALE AND CHELATION,
Petrolite Corp., St. Louis, Mo. (Assignee).
For primary bibliographic entry see Field 5F.
W76-05030

PROTECTING REINFORCED CONCRETE PIPE SANITARY SEWERS,
For primary bibliographic entry see Field 8F.
W76-05099

CORROSION IN DISPOSAL WELLS,
Subsurface Disposal Corp., Houston, Tex.
For primary bibliographic entry see Field 5E.
W76-05125

THE DETECTION AND MAPPING OF SUBTERRANEAN WATER BEARING CHANNELS--PHASE II,
Missouri Univ., Rolla. Dept. of Geophysics.
For primary bibliographic entry see Field 4B.
W76-05129

COMPLEXES AFFECTING THE SOLUBILITY OF CALCIUM CARBONATE IN WATER - PHASE II,
Illinois State Water Survey, Urbana.
T. E. Larson, F. W. Sollo, Jr., and F. F. McGurk.
Available from the National Technical Information Service, Springfield, Va, 22161, as PB-250 458, $4.50 in paper copy, $2.25 in microfiche. Illinois Water Resources Center, Urbana, Research Report No. 108, February 1976. 57 p, 17 tab, 39 ref. OWRT B-082-ILL(1). 14-31-0001-4078.

Descriptors: *Hardness(Water), *Scaling, *Corrosion, *Calcium carbonate, Magnesium, Sodium, Potable water, Water quality, *Solubility, *Hydrogen ion concentration, Volumetric analysis, Water supply.
Identifiers: Complexes, Dissociation constants, pHs.

Water utilities have a tremendous investment in the miles of pipe, valves, and other appurtenances in water distribution systems. Failure to protect these systems against corrosion and excessive scale formation could necessitate replacement of the distribution systems at an estimated cost of $25 billion. Calculation of the true equilibrium or saturation pH, pHs, for calcium carbonate and adjustment of the water to that pH is essential to supply water of high quality and to avoid corrosion and scale formation in these water distribution systems. In some cases the actual pH must be from 0.6 to 1.0 unit above pHs, as determined from the calcium and alkalinity analyses. Certain complexes may be responsible in part for this fact. The objective of this study was to evaluate the dissociation constants of the complexes so that the optimum pH can be more accurately calculated. A titration method was used to measure the effects of complex formation on the pH of reaction mixtures and appropriate computer programs were developed to calculate the dissociation constants. Experimental procedures and results from the determination of dissociation constants for complexes of magnesium, calcium and sodium with carbonate, bicarbonate, hydroxide, and sulfate and a method to utilize these constants in calculating pHs in public water supplies are discussed. (See also W73-13004)
W76-05180

SALINE WATER CONVERSION ENGINEERING DATA BOOK - 1975.
Kellogg (M. W.) Co., Piscataway, N. J.
For primary bibliographic entry see Field 3A.
W76-05347

GUIDELINES FOR THE SELECTION OF TURBINE PUMP MATERIALS FOR USE IN GROUNDWATERS,
Queensland Univ., Brisbane (Australia). Dept. of Chemical Engineering.
G. J. Kelly, and R. G. Kemp.
Australian Water Resources Council Technical Paper No. 14, 1975. 33 p, 4 fig, 6 tab, 3 append.

Descriptors: *Pumps, *Corrosion, *Groundwater, Materials, *Australia, Chemical properties, Water wells, Hydrogen ion concentration, Salinity, Hardness(Water), Materials testing, Alloys, Stainless steel.

The vertical turbine pump is frequently used in Australia to supply water for irrigation, urban and industrial requirements. The results of a survey of areas in which corrosion problems of varying intensity have occurred are used to identify the factors determining corrosivity of groundwater; and a series of tests also compared the resistance of several alternative materials for pump construction. The factors identified as indicators of corrosivity are pH, Langelier Saturation index, and the ratio of chlorides to carbonates. A table gives values of these indices for groundwater at a range of Australian locations. Methods of field determination of the factors are given in the appendices. Wrought martensitic and cast austenitic stainless steels are shown to be suitable for pump construction in a wide range of bore waters. (CSIRO)
W76-05406

SUPPRESSION OF DOMESTIC WATER HAMMER NOISE BY A SIMPLE WAVE DISPERSION TECHNIQUE,
New South Wales Univ., Kensington (Australia). Faculty of Military Studies.
T. B. Guy.
Water (Journal of the Australian Water and Wastewater Association) Vol. 2, No. 4, p 12-15, December, 1975. 5 fig, 1 ref.

Descriptors: *Water hammer, *Attenuation, *Domestic water, Pipelines, Waves(Water), Surges, Water pressure, Hydraulic equipment.
Identifiers: *Wave dispersion, *Noise suppression(Water).

Shock wave and sound wave attenuation by the wave dispersion technique is already established for the case of waves in air, but has never been applied previously to the case of hydraulic waves in liquids. An example of the efficiency of a wave dispersion type attenuator in reducing impulsive hydraulic noise is described by its application to a domestic water supply system. The attenuation technique is shown to substantially reduce the impulsive noise from a domestic water meter and rapid turnoff of a tap, using a relatively small and simply constructed attenuator. (CSIRO)
W76-05408

WATER TREATMENT--TECHNIQUE FOR ENERGY CONSERVATION,
Betz Entec, Inc., Trevose, Pa.
For primary bibliographic entry see Field 5F.
W76-05438

8I. Fisheries Engineering

DIELDRIN CONTAMINATION OF CHANNEL CATFISH, INVERTEBRATES AND MINNOWS FROM THE DES MOINES RIVER,
Iowa Cooperative Fishery Unit, Ames.
For primary bibliographic entry see Field 5C.
W76-05457

A PRELIMINARY REPORT ON THE CONEWAGO CREEK FAUNAL SURVEY, LANCASTER COUNTY, PENNSYLVANIA,
York Coll., Pa.
For primary bibliographic entry see Field 5C.
W76-05470

9. MANPOWER, GRANTS AND FACILITIES

9A. Education (Extramural)

WATER RESOURCES CENTER ANNUAL REPORT, JULY 1, 1974-JUNE 30, 1975.
California Univ., Davis. Water Resources Center.
For primary bibliographic entry see Field 9D.
W76-05247

1974-1975 ANNUAL REPORT, WATER RESOURCES RESEARCH INSTITUTE OF THE UNIVERSITY OF NORTH CAROLINA.
North Carolina Water Resources Research Inst., Raleigh.
For primary bibliographic entry see Field 9D.
W76-05255

9B. Education (In-House)

MANUAL FOR TRAINING IN THE APPLICATION OF THE PRINCIPLES AND STANDARDS OF THE WATER RESOURCES COUNCIL.
Colorado State Univ., Fort Collins. Environmental Resources Center.
Available from the National Technical Information Service, Springfield, Va 22161, as PB-250 959 $13.00 in paper copy, $2.25 in microfiche. Colorado Environmental Resources Center, Fort Collins, December 1974. 515 p, 138 fig, 21 tab, 18 ref, 2 append. Edited by H. P. Caulfield, H. A. Steele, and S. H. Johnson, Jr. OWRT C-5345(No. 4242).

Descriptors: Water resources, *Cost-benefit analysis, *Planning, *Regional analysis, *River basin development, *Training, Costs, Benefits, Decision making, Projections, Measurement, Economic impact, Environmental effects, Systems analysis, Publications, *U S Water Resources Council, Regional Development.
Identifiers: Public participation, Social well-being, National economic development, Environmental quality.

Materials for the conduct of training courses are set forth. Principles and Standards relate directly to Federal water resources planning but state and local agencies and private firms need to understand their application to Federal and Federally assisted projects. Levels of planning are identified: framework studies and assessment which deal with major policy decisions; regional or river basin plans; and implementation studies. The Principles apply at all levels but the components of objectives will be specified differently though in a manner providing insights about tradeoffs among alternatives. The planning process is visualized in 5 steps: identification of components of objectives; evaluation of resource capabilities; development of alternative plans; examination of beneficial and adverse effects on the accounts of national economic development (NED), environmental quality (EQ), regional development (RD), and social well-being (SWB); and selection of a plan. Discussed in detail are: the planning process which is viewed as an open process responsive at all levels to preferences of the affected public; projections which require comparing beneficial and adverse conditions with and without the plan under consideration, and sensitivity analysis to deal with uncertainty; environmental projections and carrying capacity models; measurement of NED, EQ, RD, and SWB effects; the application of systems analysis to planning problems including cost accounting, cost allocations and river basin simulation; and the role of public participation in the decision-making process. (Smith - North Carolina).
W76-05348

EVALUATION REPORT OF THE TRAINING PROGRAM ON TRANSFER OF TECHNOLOGY..TRAINING OF GOVERNMENT PERSONNEL IN THE APPLICATION OF THE PRINCIPLES, STANDARDS AND PROCEDURES FOR PLANNING OF THE WATER RESOURCES COUNCIL,
Colorado State Univ., Fort Collins. Human Factors Research Lab.
D. D. Sjogren, and R. D. Wittman.
Available from the National Technical Information Service, Springfield, Va 22161, as PB-250 965 $5.00 in paper copy, $2.25 in microfiche. Colorado Environmental Research Center, Fort Collins, December 1974. for planning of the Water Resources Center. 90 p 4 append. OWRT-X-143(No.4260).

Descriptors: Water Resources, *Planning, *Training, *Evaluation, Technology, Personnel, *U S Water Resource Council, Standards, Information exchange.
Identifiers: *Government personnel, Bear River Basin, *Technology transfer.

The 47 trainees and 33 observers at this training session August 11-27, 1974, had diverse backgrounds and had been involved to varying degrees with the Principles and Standards (P and S) for planning of the Water REsources Council. Training was held because of changes in P and S and an awareness of disparity between planning expectations and final planning product. Before training, expert advice was solicited and many suggestions were incorporated into training. Program consisted of 5 days dealing with conceptual issues and 5 days of practical simulation. It was considered successful, well coordinated and held in excellent facilities. Negative comments concerned the planning exercise: too contrived, too complex for the time allowed, and not coordinated with the rest of the program, though well worth doing. Some felt the formal lectures were too long and also too familiar for those who were more experienced, indicating that those with unusual backgrounds were not as well served. A majority said they would recommend the course to others. Sessions at noon were used for feedback and questionnaires were given to 6 trainees questioning the quality of the day's sessions. Comments at end of program were diverse: expected more controversy; highlighted problems; because of diverse levels of understanding, presentations had to be basic and general; program well organized; expected gap between concept and application was confirmed. Most positive aspect was the opportunity to interact with a spectrum of other professionals. On the average trainees felt that the content level of the sessions was about right, as was the quantity of material. (Smith -North Carolina)
W76-05349

9D. Grants, Contracts, and Research Act Allotments

WATER RESOURCES CENTER ANNUAL REPORT, JULY 1, 1974-JUNE 30, 1975.
California Univ., Davis. Water Resources Center.
Available from the National Technical Information Service, Springfield, Va 22161, as PB-250 780, $5.50 in paper copy, $2.25 in microfiche. University of California Water Resources Center Report No. 34, December 1975. 104 p. OWRT A-999-CAL(11).

Descriptors: *Research and development, *Water resources institute, *California, *Projects, Grants, Contracts, Universities training, Education, Project life.
Identifiers: Freshwater projects, Research results.

The principal investigators of fresh water projects sponsored by the Water Resources Center have submitted their annual reports, from which the most essential information has been abstracted to form this narrative section. The individual narratives have been purposely kept brief. Each emphasized, wherever possible, the 'hard' results and the actual or potential applications of those results to benefit affected interests. Shown also are starting and scheduled ending dates for each research project. The reader may infer from these the relative degree of progress achieved to date, together with an indication of when further information might become available--usually at least six months after completion of the project for any detailed account. The Report covers both State of California and Federally funded research activities. (Snyder-California, Davis)
W76-05247

1974-1975 ANNUAL REPORT, WATER RESOURCES RESEARCH INSTITUTE OF THE UNIVERSITY OF NORTH CAROLINA.
North Carolina Water Resources Research Inst., Raleigh.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-250 720, $4.50 in paper copy, $2.25 in microfiche. 1975 Annual Report, Report UNC-WRRI-75-00, (1976), 58 p. OWRT A-999-NC(47), 14-31-0001-5033.

Descriptors: *Water Resources Institute, Education, *Research and development, *North Carolina, *Projects, Grants, Contracts, Universities, Training.

The Water Resources Research Institute is The University of North Carolina's water research center. Located at N. C. State University at Raleigh, the Institute serves all sixteen campuses of The University of North Carolina System. It works closely with the Department of Natural and Economic Resources and other agencies in the formulation of a research program responsive to State water resource problems. A 26-man Advisory Committee representative of State and Federal water agencies, industry, conservation, agriculture, local government, and the general public provides program guidance and review. The Institute's research program for FY 1974-75 was supported by an annual allotment and 13 matching grants from OWRT, USDI; a grant from EPA; matching State appropriations; matching funds from Pickle Packers International, Inc. (made direct to the principal investigator); and grants from the Division of Environmental Management, N. C. Department of Natural and Economic Resources. One research project was jointly supported by the Institute and the University of North Carolina Sea Grant Program. All senior colleges and universities in North Carolina are eligible to participate in the Institute's program. During FY 1974-75, projects were conducted at N. C. State University, University of North Carolina at Chapel Hill, Duke University, East Carolina University, and University of North Carolina at Charlotte.
W76-05255

10. SCIENTIFIC AND TECHNICAL INFORMATION

10C. Secondary Publication And Distribution

BIBLIOGRAPHY OF WATER RESOURCES OF THE HAWAIIAN ISLANDS,
Hawaii Univ., Honolulu. Water Resources Research Center.
R. T. Pfund, and J. W. Wickes.
Available from the National Technical Information Service, Springfield, Va. 22161, as PB-250 115, $5.50 in paper copy, $2.25 in microfiche copy. Technical Report No. 88, May 1975, 111 p. OWRT A-042-HI(1), 14-01-0001-4011.

Descriptors: *Bibliographies, *Hawaii, *Publications, Aquifers, Floods, Islands, Groundwater, Geology, Hydrology, *Irrigation, Climatology, Meteorology, Pesticides, Rainfall, Sewage, Sewage treatment, Water resources, Water pollution, Soils, Legislation, Water management(Applied), Computer programs.

This bibliography is a compilation of approximately 1,000 references on studies of water resources of the Hawaiian Islands; it complements and supplements an earlier compilation with the same title (see W72-00805). An IBM KWIC (Key Word in Context) program, written in FORTRAN, was modified to collate the information and provide author and subject indexes.
W76-05013

MUNICIPAL WASTEWATER TREATMENT WORKS CONSTRUCTION GRANTS, REFERENCES, REGULATIONS, GUIDANCE, PROCEDURES.
Environmental Protection Agency, Washington, D.C. Office of Water Program Operations.
For primary bibliographic entry see Field 5D.
W76-05075

PETROLEUM PROCESSING WASTES, (LITERATURE REVIEW),
Weston (Roy F.), Inc., West Chester, Pa.
For primary bibliographic entry see Field 5D.
W76-05093

STEEL INDUSTRY WASTES, (LITERATURE REVIEW),
Illinois Inst. of Tech., Chicago. Dept. of Environmental Engineering.
For primary bibliographic entry see Field 05D.
W76-05094

TEXTILE WASTES, (LITERATURE REVIEW),
Talbot (Richard S.) Associates, Media, Pa.
For primary bibliographic entry see Field 05D.
W76-05095

POLLUTION EFFECTS ON SURFACE AND GROUND WATERS, (LITERATURE REVIEW),
Hawaii Univ., Honolulu. Dept. of Civil Engineering.
For primary bibliographic entry see Field 05B.
W76-05176

1973 WESTERN STATE CONFERENCE ON WATER INFORMATION DISSEMINATION.
Arizona Water Resources Research Center, Tucson.
For primary bibliographic entry see Field 10D.
W76-05270

10D. Specialized Information Center Services

1973 WESTERN STATE CONFERENCE ON WATER INFORMATION DISSEMINATION.
Arizona Water Resources Research Center, Tucson.
Proceedings of a Conference held June 8, 1973, Phoenix, Arizona. 98 p. OWRT A-999-ARIZ(4).

Descriptors: *Water resources, *Information exchange, *Conferences, *Information retrieval, Publications, Computers, Communication, Water quality, Water supply, Southwest U.S.
Identifiers: *Western U.S., *Water information systems.

The purpose of this conference was to bring together the researcher and user on a regional basis in an attempt to produce new ideas and directions that can lead to the coordinated action needed to improve the dissemination of water information. Reports were presented on the water resources information dissemination activities of the various states. Two panel discussions were also held. These concerned ways that information systems can better respond to state needs, and the needs and opportunities for coordinated regional or interstate action. (Sims - ISWS)
W76-05270

10F. Preparation Of Reviews

PRETREATMENT AND ULTIMATE DISPOSAL OF WASTEWATER SOLIDS,
Environmental Protection Agency, New York. Region II.
For primary bibliographic entry see Field 05D.
W76-05079

PETROLEUM PROCESSING WASTES, (LITERATURE REVIEW),
Weston (Roy F.), Inc., West Chester, Pa.
For primary bibliographic entry see Field 05D.
W76-05093

STEEL INDUSTRY WASTES, (LITERATURE REVIEW),
Illinois Inst. of Tech., Chicago. Dept. of Environmental Engineering.
For primary bibliographic entry see Field 05D.
W76-05094

TEXTILE WASTES, (LITERATURE REVIEW),
Talbot (Richard S.) Associates, Media, Pa.
For primary bibliographic entry see Field 05D.
W76-05095

POLLUTION EFFECTS ON SURFACE AND GROUND WATERS, (LITERATURE REVIEW),
Hawaii Univ., Honolulu. Dept. of Civil Engineering.
For primary bibliographic entry see Field 05B.
W76-05176

AN ASSESSMENT OF EUTROPHICATION IN AUSTRALIAN INLAND WATERS,
Department of Environment, Canberra (Australia).
For primary bibliographic entry see Field 05C.
W76-05405

SUBJECT INDEX

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Removal of Trace Levels of 2-Acetylaminofluorene (2-AAF) from Wastewater,
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W76-05402 2G

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W76-05277 5D

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W76-05478 5C

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W76-05117 5D

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Sorption Method for the Purification of Petroleum Containing Waste Waters (Sorbtsionnye netody ochistki neftesoderzhashchikh stochnykh vod),
W76-05489 5D

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W76-05494 5D

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W76-05028 5D

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W76-05065 5D

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W76-05077 5C

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W76-05105 5D

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